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(54) METHOD FOR FABRICATING SEMICONDUCTOR LIGHT EMITTING ELEMENT, SEMICONDUCTOR LIGHT EMITTING ELEMENT, METHOD FOR FABRICATING SEMICONDUCTOR ELEMENT, SEMICONDUCTOR ELEMENT, METHOD FOR FABRICATING ELEMENT, AND ELEMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To realize a highly reliable semiconductor light emitting element

having good emission characteristics and a long lifetime, a highly reliable semiconductor element having good characteristics and a long lifetime.

SOLUTION: At the time of fabricating a semiconductor light emitting element or a semiconductor element by growing a nitride based III-V compound semiconductor layer for forming a light emitting element structure or an element structure on a nitride based III-V compound semiconductor substrate 1 where a plurality of second regions B having a second mean dislocation density higher than a first mean dislocation density are arranged regularly in a first region A of crystal having the first mean dislocation density, an element region 2 is defined on the nitride based III-V compound semiconductor substrate such that the second region B is not included substantially or the second region B is not included in the emission region 2 or the active region.

CLAIMS

[Claim(s)]

[Claim 1]The 1st average dislocation density. A nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly. A manufacturing method of a semiconductor light emitting element which is a

manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by making it grow up, and is characterized by demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included substantially.

[Claim 2]A manufacturing method of the semiconductor light emitting element according to claim 1 deciding a size of the above-mentioned element region, and arrangement that the 2nd field of the above is not included substantially.

[Claim 3]A manufacturing method of the semiconductor light emitting element according to claim 1 having arranged periodically two or more 2nd fields of the above.

[Claim 4]A manufacturing method of the semiconductor light emitting element according to claim 1 having arranged periodically two or more 2nd fields of the above in the shape of a hexagonal lattice.

[Claim 5]A manufacturing method of the semiconductor light emitting element according to claim 1 having arranged periodically two or more 2nd fields of the above in the shape of a rectangular grid.

[Claim 6]A manufacturing method of the semiconductor light emitting element according to claim 1 having arranged periodically two or more 2nd fields of the above in the shape of a tetragonal lattice.

[Claim 7]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein the above-mentioned element region is a rectangle.

[Claim 8]A manufacturing method of the semiconductor light emitting element according to claim 7, wherein a neighborhood of a couple which the above-mentioned element region counters mutually is parallel to the <1-100> direction and a neighborhood of a couple which counters mutually [others] is parallel to the <11-20> direction.

[Claim 9]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein the above-mentioned element region is a square.

[Claim 10]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein an interval of the 2nd two field of the above that adjoins mutually is not less than 20 micrometers.

[Claim 11]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein an interval of the 2nd two field of the above that adjoins mutually is not less than 50 micrometers.

[Claim 12]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein an interval of the 2nd two field of the above that adjoins

mutually is not less than 100 micrometers.
[Claim 13]A manufacturing method of the semiconductor light emitting element according to claim 3, wherein an array cycle of the 2nd field of the above is not less than 20 micrometers.
[Claim 14]A manufacturing method of the semiconductor light emitting element according to claim 3, wherein an array cycle of the 2nd field of the above is not less than 50 micrometers.
[Claim 15]A manufacturing method of the semiconductor light emitting element according to claim 3, wherein an array cycle of the 2nd field of the above is not less than 100 micrometers.
[Claim 16]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein the 2nd field of the above has penetrated the above-mentioned nitride system group-III-V-semiconducter board.
[Claim 17]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein the 2nd field of the above has unfixed multiple pillar-like shape.
[Claim 18]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein the 3rd field that has the 3rd average dislocation density lower than the 2nd average dislocation density of the above more highly than the 1st average dislocation density of the above is provided between the 1st field of the above, and the 2nd field of the above.
[Claim 19]A manufacturing method of the semiconductor light emitting element according to claim 18 demarcating the above-mentioned element region so that the 2nd field of the above and the 3rd field of the above may not be included substantially.
[Claim 20]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein a diameter of the 2nd field of the above is not less than 10 micrometers 100 micrometers or less.
[Claim 21]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein a diameter of the 2nd field of the above is not less than 20 micrometers 50 micrometers or less.
[Claim 22]A manufacturing method of the semiconductor light emitting element according to claim 18, wherein a diameter of the 3rd field of the above is larger than a diameter of the 2nd field of the above not less than 20 micrometers 200 micrometers or less.
[Claim 23]A manufacturing method of the semiconductor light emitting element according to claim 18, wherein a diameter of the 3rd field of the above is larger than a

diameter of the 2nd field of the above not less than 40 micrometers 160 micrometers or less.

[Claim 24]A manufacturing method of the semiconductor light emitting element according to claim 18, wherein a diameter of the 3rd field of the above is larger than a diameter of the 2nd field of the above not less than 60 micrometers 140 micrometers or less.

[Claim 25]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein average dislocation density of the 2nd field of the above is 5 or more times of average dislocation density of the 1st field of the above.

[Claim 26]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein average dislocation density of the 2nd field of the above is more than $1x10^{8}cm^{-2}$.

[Claim 27]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein average dislocation density of below $2x10^{6}cm^{-2}$ and the 2nd field of the above of average dislocation density of the 1st field of the above is more than $1x10^{8}cm^{-2}$.

[Claim 28]Average dislocation density of the 1st field of the above Below $2x10^{6}cm^{-2}$. A manufacturing method of the semiconductor light emitting element according to claim 18 average dislocation density of the 3rd field of the above of average dislocation density of the 2nd field of the above is [more than $1x10^{8}cm^{-2}$] lower than $1x10^{8}cm^{-2}$, and being larger than $2x10^{6}cm^{-2}$.

[Claim 29]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein a luminous region of the above-mentioned semiconductor light emitting element has separated 1 micrometers or more from the 2nd field of the above.

[Claim 30]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein a luminous region of the above-mentioned semiconductor light emitting element has separated not less than 10 micrometers from the 2nd field of the above.

[Claim 31]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein a luminous region of the above-mentioned semiconductor light emitting element has separated not less than 100 micrometers from the 2nd field of the above.

[Claim 32]A manufacturing method of the semiconductor light emitting element according to claim 18, wherein a luminous region of the above-mentioned semiconductor light emitting element does not include the 2nd field of the above, and

the 3rd field of the above.
[Claim 33]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein a field where driving current is sent via a stripe like electrode in the above-mentioned semiconductor light emitting element has separated 1 micrometers or more from the 2nd field of the above.
[Claim 34]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein a field where driving current is sent via a stripe like electrode in the above-mentioned semiconductor light emitting element has separated not less than 10 micrometers from the 2nd field of the above.
[Claim 35]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein a field where driving current is sent via a stripe like electrode in the above-mentioned semiconductor light emitting element has separated not less than 100 micrometers from the 2nd field of the above.
[Claim 36]A manufacturing method of the semiconductor light emitting element according to claim 18, wherein a field where driving current is sent via a stripe like electrode in the above-mentioned semiconductor light emitting element does not include the 2nd field of the above, and the 3rd field of the above.
[Claim 37]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein a border line of the above-mentioned element region contains a straight line which connects 2nd at least two field of the above that adjoins mutually.
[Claim 38]A manufacturing method of the semiconductor light emitting element according to claim 1 performing scribing of the above-mentioned nitride system group-III-V-semiconducter board with which the above-mentioned nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.
[Claim 39]A manufacturing method of the semiconductor light emitting element according to claim 38 performing the above-mentioned scribing by cleavage.
[Claim 40]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein a border line of the above-mentioned element region has separated 1 micrometers or more from the 2nd field of the above.
[Claim 41]A manufacturing method of the semiconductor light emitting element according to claim 1 performing scribing of the above-mentioned nitride system group-III-V-semiconducter board with which the above-mentioned nitride system group-III-V-semiconducter layer grew along a border line which separated 1 micrometers or more from the 2nd field of the above.

[Claim 42]A manufacturing method of the semiconductor light emitting element according to claim 41 performing the above-mentioned scribing by cleavage.
[Claim 43]The above-mentioned nitride system group-III-V-semiconducter board $aluminum_XB_yGa_{1-x-y-z}In_zAs_uN_{1-u-v}P_v$. A manufacturing method of the semiconductor light emitting element according to claim 1 consisting of ($0<=x<=1$, $0<=y<=1$, $0<=z<=1$, $0<=u<=1$, $0<=v<=1$, $0<=x+y+z<1$, $0<=u+v<1$). [however,]
[Claim 44]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein the above-mentioned nitride system group-III-V-semiconducter board consists of $aluminum_XB_yGa_{1-x-y-z}In_zN$ (however, $0<=x<=1$, $0<=y<=1$, $0<=z<=1$, $0<=x+y+z<1$).
[Claim 45]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein the above-mentioned nitride system group-III-V-semiconducter board consists of $aluminum_XGa_{1-x-z}In_zN$ (however, $0<=x<=1$, $0<=z<=1$).
[Claim 46]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein the above-mentioned nitride system group-III-V-semiconducter board consists of GaN(s).
[Claim 47]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein the above-mentioned semiconductor light emitting element is a semiconductor laser.
[Claim 48]A manufacturing method of the semiconductor light emitting element according to claim 1, wherein the above-mentioned semiconductor light emitting element is a light emitting diode.
[Claim 49]The 1st average dislocation density. A nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly is grown up, A semiconductor light emitting element manufacturing by performing scribing of the above-mentioned nitride system group-III-V-semiconducter board with which the above-mentioned nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.
[Claim 50]The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a

nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above have arranged regularly grew up to be, A semiconductor light emitting element, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned nitride system group-III-V-semiconducter board.

[Claim 51]The 1st average defect density. A nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly. A manufacturing method of a semiconductor light emitting element which is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by making it grow up, and is characterized by demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included substantially.

[Claim 52]The 1st average defect density. A nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly is grown up, A semiconductor light emitting element manufacturing by performing scribing of the above-mentioned nitride system group-III-V-semiconducter board with which the above-mentioned nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.

[Claim 53]The 1st average defect density. All over the 1st field that consists of a crystal which it has. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above have arranged regularly grew up to be, A semiconductor light emitting element, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned nitride system group-III-V-semiconducter board.

[Claim 54]By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals. A manufacturing

method of a semiconductor light emitting element which is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, and is characterized by demarcating an element region so that the 2nd field of the above may not be included substantially.

[Claim 55]A manufacturing method of the semiconductor light emitting element according to claim 54 with which the 1st field of the above is a single crystal, and the 2nd field of the above is characterized by a single crystal, polycrystal, or amorphous or intermingling two or more [these].

[Claim 56]A nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals is grown up, A semiconductor light emitting element manufacturing by performing scribing of the above-mentioned nitride system group-III-V-semiconducter board with which the above-mentioned nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.

[Claim 57]It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, A semiconductor light emitting element, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned nitride system group-III-V-semiconducter board.

[Claim 58]The 1st average dislocation density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly. A manufacturing method of a semiconductor device which is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and is characterized by demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included substantially.

[Claim 59]A manufacturing method of the semiconductor device according to claim 58 deciding a size of the above-mentioned element region, and arrangement that the 2nd field of the above is not included substantially.

[Claim 60]A manufacturing method of the semiconductor device according to claim 58 having arranged periodically two or more 2nd fields of the above.
[Claim 61]A manufacturing method of the semiconductor device according to claim 58 having arranged periodically two or more 2nd fields of the above in the shape of a hexagonal lattice.
[Claim 62]A manufacturing method of the semiconductor device according to claim 58 having arranged periodically two or more 2nd fields of the above in the shape of a rectangular grid.
[Claim 63]A manufacturing method of the semiconductor device according to claim 58 having arranged periodically two or more 2nd fields of the above in the shape of a tetragonal lattice.
[Claim 64]A manufacturing method of the semiconductor device according to claim 58, wherein the above-mentioned element region is a rectangle.
[Claim 65]A manufacturing method of the semiconductor device according to claim 58, wherein a neighborhood of a couple which the above-mentioned element region counters mutually is parallel to the <1-100> direction and a neighborhood of a couple which counters mutually [others] is parallel to the <11-20> direction.
[Claim 66]A manufacturing method of the semiconductor device according to claim 58, wherein the above-mentioned element region is a square.
[Claim 67]A manufacturing method of the semiconductor device according to claim 58, wherein an interval of the 2nd two field of the above that adjoins mutually is not less than 20 micrometers.
[Claim 68]A manufacturing method of the semiconductor device according to claim 58, wherein an interval of the 2nd two field of the above that adjoins mutually is not less than 100 micrometers.
[Claim 69]A manufacturing method of the semiconductor device according to claim 58, wherein an array cycle of the 2nd field of the above is not less than 20 micrometers.
[Claim 70]A manufacturing method of the semiconductor device according to claim 58, wherein an array cycle of the 2nd field of the above is not less than 100 micrometers.
[Claim 71]A manufacturing method of the semiconductor device according to claim 58, wherein the 2nd field of the above has penetrated the above-mentioned nitride system group-III-V-semiconducter board.
[Claim 72]A manufacturing method of the semiconductor device according to claim 58, wherein the 2nd field of the above has unfixed multiple pillar-like shape.
[Claim 73]A manufacturing method of the semiconductor device according to claim 58, wherein the 3rd field that has the 3rd average dislocation density lower than the 2nd

average dislocation density of the above more highly than the 1st average dislocation density of the above is provided between the 1st field of the above, and the 2nd field of the above.

[Claim 74]A manufacturing method of the semiconductor device according to claim 73 demarcating the above-mentioned element region so that the 2nd field of the above and the 3rd field of the above may not be included substantially.

[Claim 75]A manufacturing method of the semiconductor device according to claim 58, wherein a diameter of the 2nd field of the above is not less than 10 micrometers 100 micrometers or less.

[Claim 76]A manufacturing method of the semiconductor device according to claim 58, wherein a diameter of the 2nd field of the above is not less than 20 micrometers 50 micrometers or less.

[Claim 77]A manufacturing method of the semiconductor device according to claim 73, wherein a diameter of the 3rd field of the above is larger than a diameter of the 2nd field of the above not less than 20 micrometers 200 micrometers or less.

[Claim 78]A manufacturing method of the semiconductor device according to claim 73, wherein a diameter of the 3rd field of the above is larger than a diameter of the 2nd field of the above not less than 40 micrometers 160 micrometers or less.

[Claim 79]A manufacturing method of the semiconductor device according to claim 73, wherein a diameter of the 3rd field of the above is larger than a diameter of the 2nd field of the above not less than 60 micrometers 140 micrometers or less.

[Claim 80]A manufacturing method of the semiconductor device according to claim 58, wherein average dislocation density of the 2nd field of the above is 5 or more times of average dislocation density of the 1st field of the above.

[Claim 81]A manufacturing method of the semiconductor device according to claim 58, wherein average dislocation density of the 2nd field of the above is more than $1x10^{8}cm^{-2}$.

[Claim 82]A manufacturing method of the semiconductor device according to claim 58, wherein average dislocation density of below $2x10^{6}cm^{-2}$ and the 2nd field of the above of average dislocation density of the 1st field of the above is more than $1x10^{8}cm^{-2}$.

[Claim 83]Average dislocation density of the 1st field of the above Below $2x10^{6}cm^{-2}$. A manufacturing method of the semiconductor device according to claim 73 average dislocation density of the 3rd field of the above of average dislocation density of the 2nd field of the above is [more than $1x10^{8}cm^{-2}$] lower than $1x10^{8}cm^{-2}$, and being larger than $2x10^{6}cm^{-2}$.

[Claim 84]A manufacturing method of the semiconductor device according to claim 58,

wherein an active region of the above-mentioned semiconductor device has separated 1 micrometers or more from the 2nd field of the above.

[Claim 85]A manufacturing method of the semiconductor device according to claim 58, wherein an active region of the above-mentioned semiconductor device has separated not less than 10 micrometers from the 2nd field of the above.

[Claim 86]A manufacturing method of the semiconductor device according to claim 58, wherein an active region of the above-mentioned semiconductor device has separated not less than 100 micrometers from the 2nd field of the above.

[Claim 87]A manufacturing method of the semiconductor device according to claim 73, wherein an active region of the above-mentioned semiconductor device does not include the 2nd field of the above, and the 3rd field of the above.

[Claim 88]A manufacturing method of the semiconductor device according to claim 58, wherein a field where driving current is sent via a stripe like electrode in the above-mentioned semiconductor device has separated 1 micrometers or more from the 2nd field of the above.

[Claim 89]A manufacturing method of the semiconductor device according to claim 58, wherein a field where driving current is sent via a stripe like electrode in the above-mentioned semiconductor device has separated not less than 10 micrometers from the 2nd field of the above.

[Claim 90]A manufacturing method of the semiconductor device according to claim 58, wherein a field where driving current is sent via a stripe like electrode in the above-mentioned semiconductor device has separated not less than 100 micrometers from the 2nd field of the above.

[Claim 91]A manufacturing method of the semiconductor device according to claim 73, wherein a field where driving current is sent via a stripe like electrode in the above-mentioned semiconductor device does not include the 2nd field of the above, and the 3rd field of the above.

[Claim 92]A manufacturing method of the semiconductor device according to claim 58, wherein a border line of the above-mentioned element region contains a straight line which connects 2nd at least two field of the above that adjoins mutually.

[Claim 93]A manufacturing method of the semiconductor device according to claim 58 performing scribing of the above-mentioned nitride system group-III-V-semiconducter board with which the above-mentioned nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.

[Claim 94]A manufacturing method of the semiconductor device according to claim 93

performing the above-mentioned scribing by cleavage.
[Claim 95]A manufacturing method of the semiconductor device according to claim 58, wherein a border line of the above-mentioned element region has separated 1 micrometers or more from the 2nd field of the above.
[Claim 96]A manufacturing method of the semiconductor device according to claim 58 performing scribing of the above-mentioned nitride system group-III-V-semiconducter board with which the above-mentioned nitride system group-III-V-semiconducter layer grew along a border line which separated 1 micrometers or more from the 2nd field of the above.
[Claim 97]A manufacturing method of the semiconductor device according to claim 96 performing the above-mentioned scribing by cleavage.
[Claim 98]The above-mentioned nitride system group-III-V-semiconducter board aluminum$_x$B$_y$Ga$_{1-x-y-z}$In$_z$As$_u$N$_{1-u-v}$P$_v$. A manufacturing method of the semiconductor device according to claim 58 consisting of ($0<=x<=1$, $0<=y<=1$, $0<=z<=1$, $0<=u<=1$, $0<=v<=1$, $0<=x+y+z<1$, $0<=u+v<1$). [however,]
[Claim 99]A manufacturing method of the semiconductor device according to claim 58, wherein the above-mentioned nitride system group-III-V-semiconducter board consists of aluminum$_x$B$_y$Ga$_{1-x-y-z}$In$_z$N (however, $0<=x<=1$, $0<=y<=1$, $0<=z<=1$, $0<=x+y+z<1$).
[Claim 100]A manufacturing method of the semiconductor device according to claim 58, wherein the above-mentioned nitride system group-III-V-semiconducter board consists of aluminum$_x$Ga$_{1-x-z}$In$_z$N (however, $0<=x<=1$, $0<=z<=1$).
[Claim 101]A manufacturing method of the semiconductor device according to claim 58, wherein the above-mentioned nitride system group-III-V-semiconducter board consists of GaN(s).
[Claim 102]A manufacturing method of the semiconductor device according to claim 58, wherein the above-mentioned semiconductor device is a light emitting device.
[Claim 103]A manufacturing method of the semiconductor device according to claim 58, wherein the above-mentioned semiconductor device is a photo detector.
[Claim 104]A manufacturing method of the semiconductor device according to claim 58, wherein the above-mentioned semiconductor device is an electronic run element.
[Claim 105]The 1st average dislocation density. A nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly is grown up, A semiconductor device manufacturing by performing scribing of the above-mentioned

nitride system group-III-V-semiconducter board with which the above-mentioned nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.
[Claim 106]The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above have arranged regularly grew up to be, A semiconductor device, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned nitride system group-III-V-semiconducter board.
[Claim 107]The 1st average defect density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly. A manufacturing method of a semiconductor device which is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and is characterized by demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included substantially.
[Claim 108]The 1st average defect density. A nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly is grown up, A semiconductor device manufacturing by performing scribing of the above-mentioned nitride system group-III-V-semiconducter board with which the above-mentioned nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.
[Claim 109]The 1st average defect density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above have arranged regularly grew up to be, A semiconductor device, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned nitride

system group-III-V-semiconducter board.
[Claim 110]By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals. A manufacturing method of a semiconductor device which is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and is characterized by demarcating an element region so that the 2nd field of the above may not be included substantially.
[Claim 111]A manufacturing method of the semiconductor device according to claim 110 with which the 1st field of the above is a single crystal, and the 2nd field of the above is characterized by a single crystal, polycrystal, or amorphous or intermingling two or more [these].
[Claim 112]A nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals is grown up, A semiconductor device manufacturing by performing scribing of the above-mentioned nitride system group-III-V-semiconducter board with which the above-mentioned nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.
[Claim 113]It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, A semiconductor device, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned nitride system group-III-V-semiconducter board.
[Claim 114]By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form light emitting element structure on a semiconductor substrate arranged regularly. A manufacturing method of a semiconductor light emitting element which is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, and is characterized by demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd field of the above may not be included substantially.
[Claim 115]A semiconductor layer by which two or more 2nd fields that have the 2nd

average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form light emitting element structure on a semiconductor substrate arranged regularly is grown up, A semiconductor light emitting element manufacturing by performing scribing of the above-mentioned semiconductor substrate the above-mentioned semiconductor layer grew up to be along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.
[Claim 116]It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly grew up to be, A semiconductor light emitting element, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned semiconductor substrate.
[Claim 117]By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form light emitting element structure on a semiconductor substrate arranged regularly. A manufacturing method of a semiconductor light emitting element which is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, and is characterized by demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd field of the above may not be included substantially.
[Claim 118]A semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form light emitting element structure on a semiconductor substrate arranged regularly is grown up, A semiconductor light emitting element manufacturing by performing scribing of the above-mentioned semiconductor substrate the above-mentioned semiconductor layer grew up to be along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.
[Claim 119]It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly grew up to be, A semiconductor light

emitting element, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned semiconductor substrate.

[Claim 120]It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, A manufacturing method of a semiconductor light emitting element demarcating an element region so that the 2nd field of the above may not be included substantially.

[Claim 121]A semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals is grown up, A semiconductor light emitting element manufacturing by performing scribing of the above-mentioned semiconductor substrate the above-mentioned semiconductor layer grew up to be along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.

[Claim 122]It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, A semiconductor light emitting element, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned semiconductor substrate.

[Claim 123]By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a semiconductor substrate arranged regularly. A manufacturing method of a semiconductor device which is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and is characterized by demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd field of the above may not be included substantially.

[Claim 124]A semiconductor layer by which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a semiconductor substrate arranged regularly is grown up, A semiconductor device manufacturing by performing scribing of the above-mentioned semiconductor substrate the above-mentioned semiconductor layer

grew up to be along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.

[Claim 125]It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly grew up to be, A semiconductor device, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned semiconductor substrate.

[Claim 126]By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a semiconductor substrate arranged regularly. A manufacturing method of a semiconductor device which is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and is characterized by demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd field of the above may not be included substantially.

[Claim 127]A semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a semiconductor substrate arranged regularly is grown up, A semiconductor device manufacturing by performing scribing of the above-mentioned semiconductor substrate the above-mentioned semiconductor layer grew up to be along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.

[Claim 128]It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly grew up to be, A semiconductor device, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned semiconductor substrate.

[Claim 129]It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st

field that consists of crystals, A manufacturing method of a semiconductor device demarcating an element region so that the 2nd field of the above may not be included substantially.

[Claim 130]A semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals is grown up, A semiconductor device manufacturing by performing scribing of the above-mentioned semiconductor substrate the above-mentioned semiconductor layer grew up to be along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.

[Claim 131]It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, A semiconductor device, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned semiconductor substrate.

[Claim 132]By growing up a layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a substrate arranged regularly. A manufacturing method of an element which is a manufacturing method of an element which manufactured an element and is characterized by demarcating an element region on the above-mentioned substrate so that the 2nd field of the above may not be included substantially.

[Claim 133]A layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a substrate arranged regularly is grown up, An element manufacturing by performing scribing of the above-mentioned substrate with which the above-mentioned layer grew along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.

[Claim 134]It is the element a layer which forms element structure on a substrate which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly grew up to be, An element, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned substrate.

[Claim 135]By growing up a layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a substrate arranged regularly. A manufacturing method of an element which is a manufacturing method of an element which manufactured an element and is characterized by demarcating an element region on the above-mentioned substrate so that the 2nd field of the above may not be included substantially.
[Claim 136]A layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a substrate arranged regularly is grown up, An element manufacturing by performing scribing of the above-mentioned substrate with which the above-mentioned layer grew along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.
[Claim 137]It is the element a layer which forms element structure on a substrate which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly grew up to be, An element, wherein 2nd at least one field of the above exists in the end face or a corner of the above-mentioned substrate.
[Claim 138]It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, A manufacturing method of an element demarcating an element region so that the 2nd field of the above may not be included substantially.
[Claim 139]A layer which forms element structure on a substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals is grown up, An element manufacturing by performing scribing of the above-mentioned substrate with which the above-mentioned layer grew along a border line containing a straight line which connects 2nd at least two field of the above that adjoins mutually.
[Claim 140]An element, wherein crystallinity is the element a layer which forms element structure on a substrate which two or more 2nd bad fields have arranged regularly grew up to be and 2nd at least one field of the above exists in the end face or a corner of the above-mentioned substrate from this 1st field all over the 1st field that

consists of crystals.
[Claim 141]The 1st average dislocation density. A nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by making it grow up, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 142]The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above have arranged regularly grew up to be, A semiconductor light emitting element, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 143]The 1st average defect density. A nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by making it grow up, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 144]The 1st average defect density. All over the 1st field that consists of a crystal which it has. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a

nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above have arranged regularly grew up to be, A semiconductor light emitting element, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 145]By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals. A manufacturing method of a semiconductor light emitting element which is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, and is characterized by demarcating an element region so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 146]It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, A semiconductor light emitting element, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 147]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board

so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 148]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor light emitting element, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned nitride system group-III-V-semiconducter board seven or more and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 149]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 150]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a

nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor light emitting element, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned nitride system group-III-V-semiconducter board seven or more and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 151]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 152]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor light emitting element, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned nitride system group-III-V-semiconducter board seven or more and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 153]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st

interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, The 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included one or more, And a manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 154]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor light emitting element, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned nitride system group-III-V-semiconducter board one or more and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 155]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, The 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included one or more, And a manufacturing method of a semiconductor light

emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 156]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A manufacturing method of a semiconductor light emitting element, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned nitride system group-III-V-semiconducter board one or more and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 157]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, The 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included one or more, And a manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 158]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd

direction that intersects perpendicularly grew up to be, A semiconductor light emitting element, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned nitride system group-III-V-semiconducter board one or more and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 159]The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a nitride system group-III-V-semiconducter layer to form, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd seven or more fields of the above may not be included substantially and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 160]The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer to form grew up to be, A semiconductor light emitting element, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 161]The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a nitride system group-III-V-semiconducter layer to form, A manufacturing method of a semiconductor light emitting element demarcating an element region on the

above-mentioned nitride system group-III-V-semiconducter board so that the 2nd seven or more fields of the above may not be included substantially and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 162]The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer to form grew up to be, A semiconductor light emitting element, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 163]By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd seven or more fields of the above may not be included substantially and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 164]All over the 1st field that consists of crystals. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel grew up to be, A semiconductor light emitting element, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 165]The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average

dislocation density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a nitride system group-III-V-semiconducter layer to form, An interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included, And a manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 166]The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer to form grew up to be, A semiconductor light emitting element, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 167]The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a nitride system group-III-V-semiconducter layer to form, An interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included, And a manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 168]The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect

density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer to form grew up to be, A semiconductor light emitting element, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 169]By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included, And a manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 170]All over the 1st field that consists of crystals. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel grew up to be, A semiconductor light emitting element, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 171]The 1st average dislocation density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly. A manufacturing method of a semiconductor device which is a manufacturing method of a semiconductor

device which manufactured a semiconductor device, and is characterized by demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 172]The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above have arranged regularly grew up to be, A semiconductor device, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.
[Claim 173]The 1st average defect density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly. A manufacturing method of a semiconductor device which is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and is characterized by demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 174]The 1st average defect density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above have arranged regularly grew up to be, A semiconductor device, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.
[Claim 175]By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged

regularly all over the 1st field that consists of crystals. A manufacturing method of a semiconductor device which is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and is characterized by demarcating an element region so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 176]It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, A semiconductor device, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 177]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and a sequence of the 2nd field of the above of the 2nd direction of the above is not included seven or more substantially, And a manufacturing method of a semiconductor device demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 178]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned nitride system group-III-V-semiconducter board seven

or more and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.
[Claim 179]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and a sequence of the 2nd field of the above of the 2nd direction of the above is not included seven or more substantially, And a manufacturing method of a semiconductor device demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 180]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned nitride system group-III-V-semiconducter board seven or more and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.
[Claim 181]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and a sequence of the 2nd field of the above of the 2nd direction of the above is not included seven or more substantially, And a manufacturing method of a semiconductor device demarcating an element region on the above-mentioned nitride system

group-III-V-semiconducter board so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 182]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned nitride system group-III-V-semiconducter board seven or more and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.
[Claim 183]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 1st interval of the above is not less than 50 micrometers, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 184]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned nitride

system group-III-V-semiconducter board one or more and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 185]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 1st interval of the above is not less than 50 micrometers, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 186]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned nitride system group-III-V-semiconducter board one or more and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 187]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 1st interval of the above is not less than 50 micrometers, A manufacturing method of a

semiconductor device demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 188]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned nitride system group-III-V-semiconducter board one or more and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 189]The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel element structure. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a nitride system group-III-V-semiconducter layer to form, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd seven or more fields of the above may not be included substantially and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 190]The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel element structure. A semiconductor device, wherein it is the semiconductor device a nitride system group-III-V-semiconducter layer to form grew up to be, and the 2nd seven or more fields of the above are not substantially included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor

device.
[Claim 191]The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel element structure. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a nitride system group-III-V-semiconducter layer to form, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd seven or more fields of the above may not be included substantially and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 192]The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel element structure. A semiconductor device, wherein it is the semiconductor device a nitride system group-III-V-semiconducter layer to form grew up to be, and the 2nd seven or more fields of the above are not substantially included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.
[Claim 193]By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 2nd seven or more fields of the above are not included substantially, And a manufacturing method of a semiconductor device demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 194]All over the 1st field that consists of crystals. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel grew up to be, A semiconductor device, wherein the 2nd seven or

more fields of the above are not substantially included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 195]The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel element structure. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a nitride system group-III-V-semiconducter layer to form, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that an interval of the 2nd field of the above may be not less than 50 micrometers, and the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 196]The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel element structure. It is the semiconductor device a nitride system group-III-V-semiconducter layer to form grew up to be, A semiconductor device, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 197]The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel element structure. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a nitride system group-III-V-semiconducter layer to form, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that an interval of the 2nd field of the above may be not less than 50 micrometers, and the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in an active region of the

above-mentioned semiconductor device.
[Claim 198]The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel element structure. It is the semiconductor device a nitride system group-III-V-semiconducter layer to form grew up to be, A semiconductor device, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.
[Claim 199]By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and an interval of the 2nd field of the above is not less than 50 micrometers, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned nitride system group-III-V-semiconducter board so that the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 200]All over the 1st field that consists of crystals. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel grew up to be, A semiconductor device, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned nitride system group-III-V-semiconducter board and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.
[Claim 201]By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form light emitting element structure on a semiconductor substrate arranged regularly. A manufacturing method of a semiconductor light emitting element which is a manufacturing method of a semiconductor light emitting element which

manufactured a semiconductor light emitting element, and is characterized by demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 202]It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly grew up to be, A semiconductor light emitting element, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned semiconductor substrate and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 203]By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form light emitting element structure on a semiconductor substrate arranged regularly. A manufacturing method of a semiconductor light emitting element which is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, and is characterized by demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 204]It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly grew up to be, A semiconductor light emitting element, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned semiconductor substrate and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor device.

[Claim 205]It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field

have arranged regularly all over the 1st field that consists of crystals, A manufacturing method of a semiconductor light emitting element demarcating an element region so that the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 206]It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, A semiconductor light emitting element, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned semiconductor substrate and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor device.

[Claim 207]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 208]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor light emitting element, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned semiconductor substrate seven or more and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light

emitting element.
[Claim 209]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 210]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor light emitting element, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned semiconductor substrate seven or more and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 211]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in a luminous

region of the above-mentioned semiconductor light emitting element.
[Claim 212]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor light emitting element, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned semiconductor substrate seven or more and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 213]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that the 1st interval of the above may be not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 214]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor light emitting element, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned semiconductor substrate one or more and the 2nd field of the above is not included in a luminous

region of the above-mentioned semiconductor light emitting element.
[Claim 215]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that the 1st interval of the above may be not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 216]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor light emitting element, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned semiconductor substrate one or more and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 217]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that the 1st interval

of the above may be not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 218]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor light emitting element, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned semiconductor substrate one or more and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 219]By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd seven or more fields of the above may not be included substantially and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 220]The 1st average dislocation density. It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, A semiconductor light emitting element, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned semiconductor substrate and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 221]By growing up a semiconductor layer by which two or more 2nd fields that

extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd seven or more fields of the above may not be included substantially and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 222]The 1st average defect density. It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, A semiconductor light emitting element, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned semiconductor substrate and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 223]By growing up a semiconductor layer by which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd seven or more fields of the above may not be included substantially and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 224]It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, A semiconductor light emitting element, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned semiconductor substrate and the 2nd field of the above is not included in a luminous region of the

above-mentioned semiconductor light emitting element.
[Claim 225]By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that an interval of the 2nd field of the above may be not less than 50 micrometers, and the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 226]The 1st average dislocation density. It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, A semiconductor light emitting element, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned semiconductor substrate and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 227]By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that an interval of the 2nd field of the above may be not less than 50 micrometers, and the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.
[Claim 228]The 1st average defect density. It is the semiconductor light emitting

element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, A semiconductor light emitting element, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned semiconductor substrate and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 229]By growing up a semiconductor layer by which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, A manufacturing method of a semiconductor light emitting element demarcating an element region on the above-mentioned semiconductor substrate so that an interval of the 2nd field of the above may be not less than 50 micrometers, and the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 230]It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, A semiconductor light emitting element, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned semiconductor substrate and the 2nd field of the above is not included in a luminous region of the above-mentioned semiconductor light emitting element.

[Claim 231]By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a semiconductor substrate arranged regularly. A manufacturing method of a semiconductor device which is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and is characterized by demarcating an element region on the above-mentioned semiconductor

substrate so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 232]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density are the grown-up semiconductor devices, and a semiconductor layer which forms element structure on a semiconductor substrate arranged regularly An inside of the above-mentioned semiconductor substrate, A semiconductor device, wherein 2nd at least one field of the above exists in the end face or a corner and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 233]By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a semiconductor substrate arranged regularly. A manufacturing method of a semiconductor device which is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and is characterized by demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 234]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density are the grown-up semiconductor devices, and a semiconductor layer which forms element structure on a semiconductor substrate arranged regularly An inside of the above-mentioned semiconductor substrate, A semiconductor device, wherein 2nd at least one field of the above exists in the end face or a corner and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 235]It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, A manufacturing method of a semiconductor device demarcating an element region so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 236]It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields where crystallinity

is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, A semiconductor device, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned semiconductor substrate and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 237]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 238]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned semiconductor substrate seven or more and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 239]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction

that intersects perpendicularly, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 240]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned semiconductor substrate seven or more and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 241]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 242]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned semiconductor substrate seven or more and the 2nd field of the above is not included in an active region of the

above-mentioned semiconductor device.
[Claim 243]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that the 1st interval of the above may be not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 244]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned semiconductor substrate one or more and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.
[Claim 245]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that the 1st interval of the above may be not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more

and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 246]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned semiconductor substrate one or more and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 247]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that the 1st interval of the above may be not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 248]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, A semiconductor device, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned semiconductor substrate one or more and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 249]By growing up a semiconductor layer by which two or more 2nd fields that

extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a semiconductor substrate arranged regularly mutually in parallel. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 2nd seven or more fields of the above are not included substantially, And a manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 250]The 1st average dislocation density. It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, A semiconductor device, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned semiconductor substrate and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 251]By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a semiconductor substrate arranged regularly mutually in parallel. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 2nd seven or more fields of the above are not included substantially, And a manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.

[Claim 252]The 1st average defect density. It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, A semiconductor device, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned semiconductor substrate and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor

device.
[Claim 253]By growing up a semiconductor layer by which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a semiconductor substrate arranged regularly mutually in parallel. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 2nd seven or more fields of the above are not included substantially, And a manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 254]It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, A semiconductor device, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned semiconductor substrate and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.
[Claim 255]By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and an interval of the 2nd field of the above is not less than 50 micrometers, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 256]The 1st average dislocation density. It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, A semiconductor device, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned semiconductor substrate and the 2nd field of the above is not

included in an active region of the above-mentioned semiconductor device.
[Claim 257]By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and an interval of the 2nd field of the above is not less than 50 micrometers, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 258]The 1st average defect density. It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, A semiconductor device, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned semiconductor substrate and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.
[Claim 259]By growing up a semiconductor layer by which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and an interval of the 2nd field of the above is not less than 50 micrometers, A manufacturing method of a semiconductor device demarcating an element region on the above-mentioned semiconductor substrate so that the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in an active region of the above-mentioned semiconductor device.
[Claim 260]It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, A semiconductor device, wherein an interval of the 2nd field of the above is not less than 50 micrometers,

and the 2nd one or more fields of the above are included in the above-mentioned semiconductor substrate and the 2nd field of the above is not included in an active region of the above-mentioned semiconductor device.

[Claim 261]By growing up a layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a substrate arranged regularly. A manufacturing method of an element which is a manufacturing method of an element which manufactured an element and is characterized by demarcating an element region on the above-mentioned substrate so that the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 262]It is the element a layer which forms element structure on a substrate which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly grew up to be, An element, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned substrate and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Claim 263]By growing up a layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a substrate arranged regularly. A manufacturing method of an element which is a manufacturing method of an element which manufactured an element and is characterized by demarcating an element region on the above-mentioned substrate so that the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 264]It is the element a layer which forms element structure on a substrate which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly grew up to be, An element, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned substrate and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Claim 265]It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all

over the 1st field that consists of crystals, A manufacturing method of an element demarcating an element region so that the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 266]It is the element a layer which forms element structure on a substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, An element, wherein 2nd at least one field of the above exists in an inside, the end face, or a corner of the above-mentioned substrate and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Claim 267]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 268]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is the element a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, An element, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned substrate seven or more and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Claim 269]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the

above, and the 2nd direction that intersects perpendicularly, A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 270]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is the element a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, An element, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned substrate seven or more and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Claim 271]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that a sequence of the 2nd field of the above of the 2nd direction of the above may not be included seven or more substantially and the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 272]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the element a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, An element, wherein a sequence of the 2nd field of the above of the 2nd direction of the above is not substantially included in the above-mentioned substrate seven or more and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Claim 273]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists

of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that the 1st interval of the above may be not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more and the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 274]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange regularly at the 1st interval in the 1st direction, It is the element a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, An element, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned substrate one or more and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Claim 275]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that the 1st interval of the above may be not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more and the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 276]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density arrange regularly at the 1st interval in the 1st direction, It is the element a layer which forms element structure on a substrate

regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, An element, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned substrate one or more and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Claim 277]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above, and the 2nd direction that intersects perpendicularly, A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that the 1st interval of the above may be not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above may be included one or more and the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 278]Two or more 2nd fields where crystallinity is worse than this 1st field arrange regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the element a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval of the above in the 1st direction of the above and the 2nd direction that intersects perpendicularly grew up to be, An element, wherein the 1st interval of the above is not less than 50 micrometers, and a sequence of the 2nd field of the above of the 2nd direction of the above is included in the above-mentioned substrate one or more and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Claim 279]By growing up a layer in which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a substrate arranged regularly mutually in parallel. A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that it may be a manufacturing method of an element which manufactured an element, and the 2nd seven or more fields of the above may not be included substantially and the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 280]It is the element a layer which forms element structure on a substrate which

two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly mutually in parallel grew up to be, An element, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned substrate and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Claim 281]By growing up a layer in which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a substrate arranged regularly mutually in parallel. A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that it may be a manufacturing method of an element which manufactured an element, and the 2nd seven or more fields of the above may not be included substantially and the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 282]It is the element a layer which forms element structure on a substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly mutually in parallel grew up to be, An element, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned substrate and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Claim 283]It is a manufacturing method of an element which manufactured an element by growing up a layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a substrate arranged regularly mutually in parallel, A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that the 2nd seven or more fields of the above may not be included substantially and the 2nd field of the above may not be included in an active region of the above-mentioned element.

[Claim 284]It is the element a layer which forms element structure on a substrate which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, An element, wherein the 2nd seven or more fields of the above are not substantially included in the above-mentioned substrate and the 2nd field of the

above is not included in an active region of the above-mentioned element.
[Claim 285]By growing up a layer in which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a substrate arranged regularly mutually in parallel. It is a manufacturing method of an element which manufactured an element, and an interval of the 2nd field of the above is not less than 50 micrometers, A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in an active region of the above-mentioned element.
[Claim 286]It is the element a layer which forms element structure on a substrate which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density of the above all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly mutually in parallel grew up to be, An element, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned substrate and the 2nd field of the above is not included in an active region of the above-mentioned element.
[Claim 287]By growing up a layer in which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a substrate arranged regularly mutually in parallel. It is a manufacturing method of an element which manufactured an element, and an interval of the 2nd field of the above is not less than 50 micrometers, A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in an active region of the above-mentioned element.
[Claim 288]It is the element a layer which forms element structure on a substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density of the above all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly mutually in parallel grew up to be, An element, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned substrate and the 2nd field of the above is not

included in an active region of the above-mentioned element.
[Claim 289]It is a manufacturing method of an element which manufactured an element by growing up a layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a substrate arranged regularly mutually in parallel, A manufacturing method of an element demarcating an element region on the above-mentioned substrate so that an interval of the 2nd field of the above may be not less than 50 micrometers, and the 2nd one or more fields of the above may be included and the 2nd field of the above may not be included in an active region of the above-mentioned element.
[Claim 290]It is the element a layer which forms element structure on a substrate which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, An element, wherein an interval of the 2nd field of the above is not less than 50 micrometers, and the 2nd one or more fields of the above are included in the above-mentioned substrate and the 2nd field of the above is not included in an active region of the above-mentioned element.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention A manufacturing method of a semiconductor light emitting element, a manufacturing method of a semiconductor light emitting element and a semiconductor device, It applies to manufacture of the semiconductor laser using a nitride system group III-V semiconducter, a light emitting diode, or an electronic run element, concerning the manufacturing method of a semiconductor

device and an element, and an element, and is suitable.

[0002]

[Description of the Prior Art]When manufacturing a semiconductor device conventionally, the method of processing it, after growing up a desired semiconductor layer on a suitable substrate is used widely. Generally, since a semiconductor layer changes the characteristic very sensitively according to the information on substrates, such as a grating constant, the method of adopting a substrate homogeneous as the semiconductor layer to grow up, and growing a semiconductor layer epitaxially is the most desirable.

[0003]Therefore, the substrate of a semiconductor device is formed with a material homogeneous as the semiconductor used for an element, and it is required that defect density, such as a rearrangement, should moreover be low. It is because it often happens that the defect of a substrate spreads also to the semiconductor layer on it as it is, and leads to the fall of an element characteristic.

[0004]By the way, the nitride system group III-V semiconducter represented by GaN, Since the band gap is large, the development as a light emitting device of purple and the wavelength band where it is difficult to obtain with blue or other semiconductors [say / being green] further progresses from ultraviolet, and the light emitting diode (LED) and the semiconductor laser (LD) have already been put in practical use.

[0005]However, it was difficult to obtain the substrate which has difficult bulk growth, and few defects which can be used as a substrate of a semiconductor device in a nitride system group III-V semiconducter. Therefore, in almost all cases, on the substrate which is not homogeneous as nitride system groups III-V semiconducter, such as sapphire and SiC, a nitride system group's III-V semiconducter crystal growth must be performed, and techniques, such as introduction of a low temperature buffer layer, are needed. However, even by the nitride system group III-V semiconducter obtained by growing up by adopting such a technique, the defect density becomes very high and cannot disregard the influence on an element characteristic.

[0006]Therefore, it consists of a homogeneous substrate, i.e., a nitride system group III-V semiconducter, as a substrate for manufacturing a nitride system group-III-V-semiconducter element with the good characteristic, and a low thing of defect density is desired.

[0007]Until now as a manufacturing method of the low nitride system group-III-V-semiconducter board of defect density, In JP,2001-102307,A, the growth surface of vapor phase epitaxy has not a planar state but a three-dimensional facet structure, and has had facet structure. The manufacturing method of the single crystal

GaN substrate which reduced the rearrangement is proposed by making it grow up without embedding facet structure.

[0008]

[Problem(s) to be Solved by the Invention]However, the art indicated by JP,2001-102307,A, Since it is what decreases the penetration dislocation of other fields by centralizing especially penetration dislocation on a field with a growth phase, In the obtained single crystal GaN substrate, the field of low defect density and the field of high defect density are intermingled, and the position which the field of high defect density moreover generates cannot be controlled, but is generated at random. For this reason, when a nitride system group-III-V-semiconducter layer was grown up on this single crystal GaN substrate and a semiconductor device, for example, a semiconductor laser, was manufactured, it could not avoid that the field of high defect density will be formed in a luminous region, but the fall of the luminescent characteristic of a semiconductor laser or reliability was caused.

[0009]Therefore, this Object of the Invention has the good characteristics, such as a luminescent characteristic, and there are in providing the manufacturing method of the semiconductor light emitting element which can manufacture easily a reliable long lasting semiconductor light emitting element and such a semiconductor light emitting element.

[0010]More generally, this Object of the Invention has the good characteristic, and there is in providing the manufacturing method of the semiconductor device which can manufacture easily a reliable long lasting semiconductor device and such a semiconductor device.

[0011]Still more generally, this Object of the Invention has the good characteristic, and there is in providing the manufacturing method of the element which can manufacture easily reliable various kinds of long lasting elements and such elements.

[0012]

[Means for Solving the Problem]this invention person inquired wholeheartedly, in order to solve an aforementioned problem. It is as follows when the outline is explained. this invention person succeeded in controlling a position of a high defect density field generated all over a low defect density field, as a result of repeating improvement of art indicated by JP,2001-102307,A. According to this, all over a low defect density field, a substrate which a high defect density field has arranged regularly, for example, periodically, can be obtained, and an arrangement pattern of a high defect density field can also be changed freely.

[0013]Semiconductor light emitting elements, such as a semiconductor laser, and when

manufacturing a semiconductor device more generally, it is necessary using such a substrate to eliminate an adverse effect which a field of high defect density which exists in a substrate has on an element, or to decrease the adverse effect. As a result of examining many things about a technique for that, it found out that the following techniques were effective.

[0014]That is, in the above-mentioned substrate, since a high defect density field can be made to arrange regularly, it can design size of an element, arrangement of an element, or a position of an active region (it is a luminous region if it is in a light emitting device) of an element according to this arrangement. And this design can be prevented from including a high defect density field in a field (henceforth a "element region") which serves as a chip by scribing of a substrate eventually, or an active region of an element. if it does in this way, even if a defect will spread from a high defect density field of a substratum substrate to a semiconductor layer grown up on a substrate, an adverse effect by it is less than an element region or an active region -- making -- a sake -- a defect -- originating -- an element -- degradation of the characteristic, a fall of reliability, etc. can be prevented.

[0015]The above-mentioned technique is homogeneous as a semiconductor used for an element, and when it is difficult to obtain a substrate of low defect density, it is effective also in manufacture of a semiconductor device using semiconductors other than a nitride system group III-V semiconducter. More generally it is homogeneous as material used for an element, and when it is difficult to obtain a substrate of low defect density, it is effective in manufacture of such an element. This invention is thought out as a result of inquiring further based on examination of the more than depended on this invention person.

[0016]Namely, in order to solve an aforementioned problem, an invention of the 1st of this invention, The 1st average dislocation density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly. An element region was demarcated on a nitride system group-III-V-semiconducter board so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element and the 2nd field might not be included substantially.

[0017]Here, ["the 2nd field is not included substantially" and] it means also including a case where the 2nd field remains in the end face or a corner of a chip obtained not

only when a border line of an element region includes the 2nd field thoroughly, but after the border line's running along the 2nd field and performing scribing of a substrate (the following -- the same).

[0018]Specifically, an element region decides the size and arrangement that the 2nd field is not included substantially. Two or more 2nd fields are provided periodically typically, and, specifically, are provided the shape of a hexagonal lattice, the shape of a rectangular grid, and in the shape of a tetragonal lattice, for example. Two or more kinds of these arrangement patterns may be intermingled. A portion in which the 2nd field was established in periodic arrangement, and a portion provided in arrangement which is not periodic although the 2nd field was regular may be intermingled.

[0019]An element region is a rectangle or a square typically, a neighborhood of those couples that counter mutually is parallel to the <1-100> direction, and a neighborhood of a couple which counters mutually [others] is suitably more nearly parallel to the <11-20> direction than viewpoints of performing cleavage good.

[0020]Although an interval of the 2nd two field or an array cycle of the 2nd field which adjoins mutually is chosen according to a size of an element, etc., it is generally not less than 20 micrometers, not less than 50 micrometers, or not less than 100 micrometers. Although what has a not necessarily clear interval of this 2nd field or a maximum of an array cycle of the 2nd field does not exist, generally it is about 1000 micrometers. This 2nd field has penetrated a nitride system group-III-V-semiconducter board typically. This 2nd field has unfixed multiple pillar-like shape typically. Between the 1st field and the 2nd field, it is higher than the 1st average dislocation density, And the 3rd field that has the 3rd average dislocation density lower than the 2nd average dislocation density exists as a transition region in many cases, and in this case, most suitably, an element region is demarcated so that these the 2nd field and 3rd field may not be included substantially.

[0021]Not less than 10 micrometers 100 micrometers or less of diameters of the 2nd field are not less than 20 micrometers 50 micrometers or less more typically. When the 3rd field exists, typically, the diameter is larger than not less than 20 micrometers 200 micrometers or less, more typically large not less than 40 micrometers 160 micrometers or less, and most typically larger than a diameter of the 2nd field not less than 60 micrometers 140 micrometers or less.

[0022]Average dislocation density of the 2nd field is generally 5 or more times of dislocation density of the 1st field. Typically, average dislocation density of the 2nd field of average dislocation density of the 1st field is [below $2x10^{6}cm^{-2}$] more than $1x10^{8}cm^{-2}$. When the 3rd field exists, the average dislocation density is lower than

$1x10^{8}cm^{-2}$, and typically larger than $2x10^{6}cm^{-2}$.

[0023]1 micrometers or more of luminous regions [not less than 10 micrometers of / not less than 100 micrometers of] of a semiconductor light emitting element are more suitably separated from the 2nd field, in order to prevent an adverse effect by the 2nd field where average dislocation density is high. When the 3rd field exists, a luminous region of a semiconductor light emitting element is kept from including the 2nd field and 3rd field most suitably. Although semiconductor light emitting elements are a semiconductor laser and a light emitting diode, when it is the former semiconductor laser, more specifically, 1 micrometers or more of fields [not less than 10 micrometers of / not less than 100 micrometers of] where driving current is sent via a stripe like electrode are more suitably separated from the 2nd field still more suitably. When the 3rd field exists, a field where driving current is sent via a stripe like electrode is kept from including the 2nd field and 3rd field most suitably. One or more number of stripe like electrodes, i.e., a laser stripe, may be formed, and can also choose the width if needed.

[0024]A border line of an element region is chosen so that the 2nd field may be a range which is not included substantially and a substrate area can be efficiently used for an element region according to arrangement patterns, those the 2nd interval or array cycle of a field, etc., but. It is chosen so that a straight line which connects 2nd at least two field that adjoins mutually typically may be included. In a scribing process for carrying out chip making, scribing of a nitride system group-III-V-semiconducter board with which a nitride system group-III-V-semiconducter layer grew is performed along a border line which contains suitably a straight line which connects this 2nd at least two field that adjoins mutually. This scribing may be performed using other methods, for example, diamond saw, and laser beams, although cleavage performs typically. If a straight line which connects 2nd at least two field that adjoins a border line of an element region mutually is contained when especially cleavage performs scribing, Since the mechanical strength is lower than the 1st field, the 2nd field where average dislocation density is higher than the 1st field has the advantage that cleavage can be performed easily and good. This is advantageous when acquiring a good resonator edge face in a semiconductor laser especially. A border line of an element region may also be chosen so that one may not pass along the 2nd field. In this case, in order to stop an adverse effect by the 2nd field to the minimum, 1 micrometers or more of border lines of an element region are suitably separated from the 2nd field. And in a scribing process, scribing of a nitride system group-III-V-semiconducter board with which a nitride system group-III-V-semiconducter layer grew is performed along a border line

separated from this 2nd field 1 micrometers or more inside.

[0025]A nitride system group-III-V-semiconducter board or a nitride system group-III-V-semiconducter layer, Most generally aluminum$_X$B$_y$Ga$_{1-x-y-z}$In$_z$As$_u$N$_{1-u-v}$P$_v$. It consists of ($0<=x<=1$, $0<=y<=1$, $0<=z<=1$, $0<=u<=1$, $0<=v<=1$, $0<=x+y+z<1$, $0<=u+v<1$), [however,] More specifically aluminum$_X$B$_y$Ga$_{1-x-y-z}$In$_z$N. It consists of ($0<=x<=1$, $0<=y<=1$, $0<=z<=1$, $0<=x+y+z<1$), and consists of aluminum$_X$Ga$_{1-x-z}$In$_z$N (however, $0<=x<=1$, $0<=z<=1$) typically. [however,] A nitride system group-III-V-semiconducter board consists of GaN(s) most typically. More than which was described in relation to an invention of the 1st of this invention is materialized also about the following inventions, unless it is contrary to that character.

[0026]An invention of the 2nd of this invention, The 1st average dislocation density. A nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly is grown up, It is a semiconductor light emitting element manufacturing by performing scribing of a nitride system group-III-V-semiconducter board with which a nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0027]An invention of the 3rd of this invention, The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density have arranged regularly grew up to be, 2nd at least one field exists in the end face or a corner of a nitride system group-III-V-semiconducter board.

[0028]An invention of the 4th of this invention, The 1st average defect density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly. An element region was demarcated on a nitride system group-III-V-semiconducter board so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element and the 2nd field might not be included substantially.

[0029]An invention of the 5th of this invention, The 1st average defect density. A

nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly is grown up, It is a semiconductor light emitting element manufacturing by performing scribing of a nitride system group-III-V-semiconducter board with which a nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0030]An invention of the 6th of this invention, The 1st average defect density. All over the 1st field that consists of a crystal which it has. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density have arranged regularly grew up to be, 2nd at least one field exists in the end face or a corner of a nitride system group-III-V-semiconducter board.

[0031]in an invention of the 4th, the 5th, and the 6th of this invention, "average defect density" means mean density of the whole lattice defect which has an adverse effect on the characteristic, reliability, etc. of an element, and all things, such as a rearrangement, a stacking fault, and a point defect, are contained in a defect (the following -- the same).

[0032]An invention of the 7th of this invention, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals. An element region was demarcated so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element and the 2nd field might not be included substantially.

[0033]An invention of the 8th of this invention grows up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, It is a semiconductor light emitting element thing manufacturing by performing scribing of a nitride system group-III-V-semiconducter board with which a nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0034]An invention of the 9th of this invention, It is the semiconductor light emitting

element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, 2nd at least one field exists in the end face or a corner of a nitride system group-III-V-semiconducter board.

[0035]in an invention of the 7th, the 8th, and the 9th of this invention, typically, the 1st field that consists of crystals is a single crystal, and, as for the 2nd field where crystallinity is worse than this 1st field, amorphous or 2 a single crystal, polycrystal, or or more [these] are intermingled (the following -- the same). This corresponds with a case where the 2nd average dislocation density or average defect density of a field is higher than the 1st average dislocation density or average defect density of a field.

[0036]An invention of the 10th of this invention, The 1st average dislocation density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly. An element region was demarcated on a nitride system group-III-V-semiconducter board so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device and the 2nd field might not be included substantially.

[0037]An invention of the 11th of this invention, The 1st average dislocation density. A nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly is grown up, It is a semiconductor device manufacturing by performing scribing of a nitride system group-III-V-semiconducter board with which a nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0038]An invention of the 12th of this invention, The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density have arranged regularly grew up to be, 2nd at least one field exists in the end face or a corner of a nitride system group-III-V-semiconducter board.

[0039]An invention of the 13th of this invention, The 1st average defect density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly. An element region was demarcated on a nitride system group-III-V-semiconducter board so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device and the 2nd field might not be included substantially.

[0040]An invention of the 14th of this invention, The 1st average defect density. A nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly is grown up, It is a semiconductor device manufacturing by performing scribing of a nitride system group-III-V-semiconducter board with which a nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0041]An invention of the 15th of this invention, The 1st average defect density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density have arranged regularly grew up to be, 2nd at least one field exists in the end face or a corner of a nitride system group-III-V-semiconducter board.

[0042]An invention of the 16th of this invention, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals. An element region was demarcated so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device and the 2nd field might not be included substantially.

[0043]An invention of the 17th of this invention grows up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, It is a semiconductor device manufacturing by performing scribing of a nitride

system group-III-V-semiconducter board with which a nitride system group-III-V-semiconducter layer grew along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0044]An invention of the 18th of this invention, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, 2nd at least one field exists in the end face or a corner of a nitride system group-III-V-semiconducter board.

[0045]In the 10th of this invention - the 18th invention, to a semiconductor device. a photo detector and an electronic run element still like field effect transistors (FET), such as a high-electron mobility transistor, or a heterojunction bipolar transistor (HBT) besides a light emitting device like a light emitting diode or a semiconductor laser is contained (the following -- the same).

[0046]In the 10th of this invention - the 18th invention, 1 micrometers or more of active regions [not less than 10 micrometers of / not less than 100 micrometers of] of a semiconductor device are more suitably separated from the 2nd field still more suitably, in order to prevent an adverse effect by the 2nd field where average dislocation density is high. When the 3rd field exists, an active region of a semiconductor device is kept from including the 2nd field and 3rd field most suitably. here, an active region means a luminous region and a field an electron runs in a light-receiving field and an electronic run element in a semiconductor photo detector in a semiconductor light emitting element (the following -- the same).

[0047]An invention of the 19th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form light emitting element structure on a semiconductor substrate arranged regularly. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element and the 2nd field might not be included substantially.

[0048]An invention of the 20th of this invention grows up a semiconductor layer by which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form light emitting element structure on a semiconductor substrate arranged regularly, It is a semiconductor light emitting element

manufacturing by performing scribing of a semiconductor substrate a semiconductor layer grew up to be along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0049]An invention of the 21st of this invention, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly grew up to be, 2nd at least one field exists in the end face or a corner of a semiconductor substrate.

[0050]An invention of the 22nd of this invention, By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form light emitting element structure on a semiconductor substrate arranged regularly. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element and the 2nd field might not be included substantially.

[0051]An invention of the 23rd of this invention grows up a semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form light emitting element structure on a semiconductor substrate arranged regularly, It is a semiconductor light emitting element manufacturing by performing scribing of the above-mentioned semiconductor substrate a semiconductor layer grew up to be along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0052]An invention of the 24th of this invention, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly grew up to be, 2nd at least one field exists in the end face or a corner of a semiconductor substrate.

[0053]An invention of the 25th of this invention, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields where

crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, An element region was demarcated so that the 2nd field might not be included substantially.

[0054]An invention of the 26th of this invention grows up a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, It is a semiconductor light emitting element manufacturing by performing scribing of the above-mentioned semiconductor substrate a semiconductor layer grew up to be along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0055]An invention of the 27th of this invention is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, 2nd at least one field exists in the end face or a corner of an account semiconductor substrate.

[0056]An invention of the 28th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a semiconductor substrate arranged regularly. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device and the 2nd field might not be included substantially.

[0057]An invention of the 29th of this invention grows up a semiconductor layer by which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a semiconductor substrate arranged regularly, It is a semiconductor device manufacturing by performing scribing of a semiconductor substrate a semiconductor layer grew up to be along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0058]The 30th invention of this invention is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st

average dislocation density have arranged regularly grew up to be, 2nd at least one field exists in the end face or a corner of a semiconductor substrate.

[0059]An invention of the 31st of this invention, By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a semiconductor substrate arranged regularly. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device and the 2nd field might not be included substantially.

[0060]An invention of the 32nd of this invention grows up a semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a semiconductor substrate arranged regularly, It is a semiconductor device manufacturing by performing scribing of the above-mentioned semiconductor substrate a semiconductor layer grew up to be along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0061]The 33rd invention of this invention is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly grew up to be, It is a semiconductor device, wherein 2nd at least one field exists in the end face or a corner of a semiconductor substrate.

[0062]An invention of the 34th of this invention, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, An element region was demarcated so that the 2nd field might not be included substantially.

[0063]An invention of the 35th of this invention grows up a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, It is a semiconductor device manufacturing by performing scribing of a semiconductor substrate a semiconductor layer grew up to be along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0064]An invention of the 36th of this invention is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, 2nd at least one field exists in the end face or a corner of a semiconductor substrate.

[0065]In the 19th of this invention - the 36th invention, material of a semiconductor substrate or a semiconductor layer, Wurtzite type (wurtzit) structure besides a nitride system group III-V semiconducter, It may be other semiconductors which more generally have a crystal structure of a hexagonal system, for example, ZnO, alpha-ZnS, alpha-CdS, alpha-CdSe, etc., and they may be various kinds of semiconductors which have a crystal structure of further others.

[0066]An invention of the 37th of this invention, It is a manufacturing method of an element which manufactured an element by growing up a layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a substrate arranged regularly, An element region was demarcated on a substrate so that the 2nd field might not be included substantially.

[0067]An invention of the 38th of this invention grows up a layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a substrate arranged regularly, It is an element manufacturing by performing scribing of a substrate with which a layer grew along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0068]The 39th invention of this invention is the element a layer which forms element structure on a substrate which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly grew up to be, 2nd at least one field exists in the end face or a corner of a substrate.

[0069]An invention of the 40th of this invention, It is a manufacturing method of an element which manufactured an element by growing up a layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a substrate arranged regularly, An element region was

demarcated on a substrate so that the 2nd field might not be included substantially.

[0070]An invention of the 41st of this invention grows up a layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a substrate arranged regularly, It is an element manufacturing by performing scribing of a substrate with which a layer grew along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0071]The 42nd invention of this invention is the element a layer which forms element structure on a substrate which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly grew up to be, 2nd at least one field exists in the end face or a corner of a substrate.

[0072]An invention of the 43rd of this invention is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, An element region was demarcated so that the 2nd field might not be included substantially.

[0073]An invention of the 44th of this invention grows up a layer which forms element structure on a substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, It is an element manufacturing by performing scribing of a substrate with which a layer grew along a border line containing a straight line which connects 2nd at least two field that adjoins mutually.

[0074]An invention of the 45th of this invention is the element a layer which forms element structure on a substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, 2nd at least one field exists in the end face or a corner of a substrate.

[0075]In the 37th of this invention - the 45th invention, an element is a piezoelectric element, a pyroelectric element, optical elements (the second harmonic generation element using a nonlinear optical crystal, etc.), a dielectric element (a ferroelectric element is included), a superconducting element, etc. besides semiconductor devices (a light emitting device, a photo detector, an electronic run element, etc.). In this case, by a semiconductor device, various kinds of above semiconductors can be used for material of a substrate or a layer, and various kinds of materials, such as an oxide, can be used

for it by piezoelectric element, pyroelectric element, optical element, dielectric element, and a superconducting element. About an oxide material. For example, Journal of the Society. There are many things, such as what was indicated by of Japan Vol.103, No.11(1995)pp.1099-1111, and Materials Science and Engineering B41 (1996) 166-173.

[0076]An invention of the 46th of this invention, The 1st average dislocation density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly. An element region was demarcated on a nitride system group-III-V-semiconducter board so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0077]An invention of the 47th of this invention, The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density have arranged regularly grew up to be, 2nd at least one field exists in an inside, the end face, or a corner of a nitride system group-III-V-semiconducter board, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0078]An invention of the 48th of this invention, The 1st average defect density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly. An element region was demarcated on a nitride system group-III-V-semiconducter board so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0079]An invention of the 49th of this invention, The 1st average defect density. All over the 1st field that consists of a crystal which it has. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which

two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density have arranged regularly grew up to be, 2nd at least one field exists in an inside, the end face, or a corner of a nitride system group-III-V-semiconducter board, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0080]An invention of the 50th of this invention, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals. An element region was demarcated so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0081]An invention of the 51st of this invention, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, 2nd at least one field exists in an inside, the end face, or a corner of a nitride system group-III-V-semiconducter board, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0082]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 52nd of this invention regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An element region was demarcated on a nitride system group-III-V-semiconducter board so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0083]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which

has the 1st average dislocation density arrange an invention of the 53rd of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a nitride system group-III-V-semiconducter board seven or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0084]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 54th of this invention regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An element region was demarcated on a nitride system group-III-V-semiconducter board so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0085]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 55th of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a nitride system group-III-V-semiconducter board seven or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0086]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 56th of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, By growing up a nitride system

group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An element region was demarcated on a nitride system group-III-V-semiconducter board so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0087]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 57th of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a nitride system group-III-V-semiconducter board seven or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0088]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 58th of this invention regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An element region was demarcated on a nitride system group-III-V-semiconducter board so that the 1st interval might be not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0089]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 59th of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting

element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a nitride system group-III-V-semiconducter board one or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0090]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 60th of this invention regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An element region was demarcated on a nitride system group-III-V-semiconducter board so that the 1st interval might be not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0091]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 61st of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a nitride system group-III-V-semiconducter board one or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0092]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 62nd of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, By growing up a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval

smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An element region was demarcated on a nitride system group-III-V-semiconducter board so that the 1st interval might be not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0093]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 63rd of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a nitride system group-III-V-semiconducter board one or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0094]An invention of the 64th of this invention, The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a nitride system group-III-V-semiconducter layer to form, An element region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0095]An invention of the 65th of this invention, The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer to form grew up to be, and the 2nd seven or more fields are not substantially included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in a

luminous region of a semiconductor light emitting element.

[0096]An invention of the 66th of this invention, The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a nitride system group-III-V-semiconducter layer to form, An element region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0097]An invention of the 67th of this invention, The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer to form grew up to be, and the 2nd seven or more fields are not substantially included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0098]An invention of the 68th of this invention, By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An element region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0099]An invention of the 69th of this invention, All over the 1st field that consists of crystals. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly

mutually in parallel grew up to be, The 2nd seven or more fields are not substantially included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0100]An invention of the 70th of this invention, The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a nitride system group-III-V-semiconducter layer to form, An element region was demarcated on a nitride system group-III-V-semiconducter board so that an interval of the 2nd field might be not less than 50 micrometers, and the 2nd one or more fields might be included and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0101]An invention of the 71st of this invention, The 1st average dislocation density. Two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer to form grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0102]An invention of the 72nd of this invention, The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a nitride system group-III-V-semiconducter layer to form, An element region was demarcated on a nitride system group-III-V-semiconducter board so that an interval of the 2nd field might be not less than 50 micrometers, and the 2nd one or more fields might be included and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0103]An invention of the 73rd of this invention, The 1st average defect density. Two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel light emitting element structure. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer to form grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0104]An invention of the 74th of this invention, By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form light emitting element structure on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An element region was demarcated on a nitride system group-III-V-semiconducter board so that an interval of the 2nd field might be not less than 50 micrometers, and the 2nd one or more fields might be included and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0105]An invention of the 75th of this invention, All over the 1st field that consists of crystals. It is the semiconductor light emitting element a nitride system group-III-V-semiconducter layer which forms light emitting element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0106]An invention of the 76th of this invention, The 1st average dislocation density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly. An element region was demarcated on a nitride system group-III-V-semiconducter board so that it might be a manufacturing method of a

semiconductor device which manufactured a semiconductor device and the 2nd field might not be included in an active region of a semiconductor device.

[0107]An invention of the 77th of this invention, The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density have arranged regularly grew up to be, 2nd at least one field exists in an inside, the end face, or a corner of a nitride system group-III-V-semiconducter board, and the 2nd field is not included in an active region of a semiconductor device.

[0108]An invention of the 78th of this invention, The 1st average defect density. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has form element structure on a nitride system group-III-V-semiconducter board arranged regularly. An element region was demarcated on a nitride system group-III-V-semiconducter board so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device and the 2nd field might not be included in an active region of a semiconductor device.

[0109]An invention of the 79th of this invention, The 1st average defect density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density have arranged regularly grew up to be, 2nd at least one field exists in an inside, the end face, or a corner of a nitride system group-III-V-semiconducter board, and the 2nd field is not included in an active region of a semiconductor device.

[0110]An invention of the 80th of this invention, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals. An element region was demarcated so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device and the 2nd field might not be included in an active region of a semiconductor device.

[0111]An invention of the 81st of this invention, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride

system group-III-V-semiconducter board which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, 2nd at least one field exists in an inside, the end face, or a corner of a nitride system group-III-V-semiconducter board, and the 2nd field is not included in an active region of a semiconductor device.

[0112]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 82nd of this invention regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and a sequence of the 2nd field of the 2nd direction is not included seven or more substantially, And an element region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd field might not be included in an active region of a semiconductor device.

[0113]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 83rd of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a nitride system group-III-V-semiconducter board seven or more, and the 2nd field is not included in an active region of a semiconductor device.

[0114]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 84th of this invention regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and a sequence of the 2nd field of the 2nd direction is not

included seven or more substantially, And an element region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd field might not be included in an active region of a semiconductor device.

[0115]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 85th of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a nitride system group-III-V-semiconducter board seven or more, and the 2nd field is not included in an active region of a semiconductor device.

[0116]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 86th of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and a sequence of the 2nd field of the 2nd direction is not included seven or more substantially, And an element region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd field might not be included in an active region of a semiconductor device.

[0117]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 87th of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a nitride system group-III-V-semiconducter board seven or more, and the 2nd field is not included in an active region of a semiconductor device.

[0118]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 88th of this invention

regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 1st interval is not less than 50 micrometers, An element region was demarcated on a nitride system group-III-V-semiconducter board so that a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in an active region of a semiconductor device.

[0119]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 89th of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, and the 1st interval is not less than 50 micrometers, A sequence of the 2nd field of the 2nd direction is included in a nitride system group-III-V-semiconducter board one or more, and the 2nd field is not included in an active region of a semiconductor device.

[0120]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 90th of this invention regularly at the 1st interval in the 1st direction, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 1st interval is not less than 50 micrometers, An element region was demarcated on a nitride system group-III-V-semiconducter board so that a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in an active region of a semiconductor device.

[0121]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 91st of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor device a nitride system

group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, and the 1st interval is not less than 50 micrometers, A sequence of the 2nd field of the 2nd direction is included in a nitride system group-III-V-semiconducter board one or more, and the 2nd field is not included in an active region of a semiconductor device.

[0122]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 92nd of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, By growing up a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 1st interval is not less than 50 micrometers, An element region was demarcated on a nitride system group-III-V-semiconducter board so that a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in an active region of a semiconductor device.

[0123]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 93rd of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, and the 1st interval is not less than 50 micrometers, A sequence of the 2nd field of the 2nd direction is included in a nitride system group-III-V-semiconducter board one or more, and the 2nd field is not included in an active region of a semiconductor device.

[0124]An invention of the 94th of this invention, The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density form element structure on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 2nd seven or more fields are not included substantially, And an element

region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd field might not be included in an active region of a semiconductor device.

[0125]An invention of the 95th of this invention, The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density have arranged regularly mutually in parallel grew up to be, The 2nd seven or more fields are not substantially included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in an active region of a semiconductor device.

[0126]An invention of the 96th of this invention, The 1st average defect density. All over the 1st field that consists of a crystal which it has. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density form element structure on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 2nd seven or more fields are not included substantially, And an element region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd field might not be included in an active region of a semiconductor device.

[0127]An invention of the 97th of this invention, The 1st average defect density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density have arranged regularly mutually in parallel grew up to be, The 2nd seven or more fields are not substantially included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in an active region of a semiconductor device.

[0128]An invention of the 98th of this invention, By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel. Are a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 2nd seven or more fields

are not included substantially, And an element region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd field might not be included in an active region of a semiconductor device.

[0129]An invention of the 99th of this invention, All over the 1st field that consists of crystals. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel grew up to be, The 2nd seven or more fields are not substantially included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in an active region of a semiconductor device.

[0130]An invention of the 100th of this invention, The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density form element structure on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and an interval of the 2nd field is not less than 50 micrometers, An element region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd one or more fields might be included and the 2nd field might not be included in an active region of a semiconductor device.

[0131]An invention of the 101st of this invention, The 1st average dislocation density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density have arranged regularly mutually in parallel grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in an active region of a semiconductor device.

[0132]An invention of the 102nd of this invention, The 1st average defect density. All over the 1st field that consists of a crystal which it has. By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density form element structure on a nitride system group-III-V-semiconducter board

arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and an interval of the 2nd field is not less than 50 micrometers, An element region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd one or more fields might be included and the 2nd field might not be included in an active region of a semiconductor device.

[0133]An invention of the 103rd of this invention, The 1st average defect density. All over the 1st field that consists of a crystal which it has. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density have arranged regularly mutually in parallel grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in an active region of a semiconductor device.

[0134]An invention of the 104th of this invention, By growing up a nitride system group-III-V-semiconducter layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a nitride system group-III-V-semiconducter board arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and an interval of the 2nd field is not less than 50 micrometers, An element region was demarcated on a nitride system group-III-V-semiconducter board so that the 2nd one or more fields might be included and the 2nd field might not be included in an active region of a semiconductor device.

[0135]An invention of the 105th of this invention, All over the 1st field that consists of crystals. It is the semiconductor device a nitride system group-III-V-semiconducter layer which forms element structure on a nitride system group-III-V-semiconducter board which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a nitride system group-III-V-semiconducter board, and the 2nd field is not included in an active region of a semiconductor device.

[0136]An invention of the 106th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form light emitting element structure on a semiconductor substrate arranged regularly. An element region was demarcated on a

semiconductor substrate so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0137]An invention of the 107th of this invention, Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density are the grown-up semiconductor light emitting elements, and a semiconductor layer which forms light emitting element structure on a semiconductor substrate arranged regularly An inside of a semiconductor substrate, 2nd at least one field exists in the end face or a corner, and the 2nd field is not included in an active region of a semiconductor device.

[0138]An invention of the 108th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form light emitting element structure on a semiconductor substrate arranged regularly. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0139]An invention of the 109th of this invention, Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density are the grown-up semiconductor light emitting elements, and a semiconductor layer which forms light emitting element structure on a semiconductor substrate arranged regularly An inside of a semiconductor substrate, 2nd at least one field exists in the end face or a corner, and the 2nd field is not included in a luminous region of a semiconductor device.

[0140]An invention of the 110th of this invention, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, An element region was demarcated so that the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0141]An invention of the 111st of this invention is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than

this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, 2nd at least one field exists in an inside, the end face, or a corner of a semiconductor substrate, and the 2nd field is not included in a luminous region of a semiconductor device.

[0142]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 112nd of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a semiconductor substrate so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0143]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 113rd of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a semiconductor substrate seven or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0144]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 114th of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a semiconductor substrate so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the

2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0145]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 115th of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a semiconductor substrate seven or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0146]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 116th of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a semiconductor substrate so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0147]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 117th of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a semiconductor substrate seven or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0148]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 118th of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method

of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a semiconductor substrate so that the 1st interval might be not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0149]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 119th of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a semiconductor substrate one or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0150]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 120th of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a semiconductor substrate so that the 1st interval might be not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0151]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 121st of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st

direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a semiconductor substrate one or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0152]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 122nd of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element by growing up a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a semiconductor substrate so that the 1st interval might be not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0153]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 123rd of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a semiconductor substrate one or more, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0154]An invention of the 124th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, and the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0155]An invention of the 125th of this invention, The 1st average dislocation density. It is the semiconductor light emitting element a semiconductor layer which forms light

emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, The 2nd seven or more fields are not substantially included in a semiconductor substrate, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0156]An invention of the 126th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, and the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0157]An invention of the 127th of this invention, The 1st average defect density. It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, The 2nd seven or more fields are not substantially included in a semiconductor substrate, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0158]An invention of the 128th of this invention, By growing up a semiconductor layer by which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, and the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0159]The 129th invention of this invention is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape with worse

crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, The 2nd seven or more fields are not substantially included in a semiconductor substrate, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0160]An invention of the 130th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An element region was demarcated on a semiconductor substrate so that an interval of the 2nd field might be not less than 50 micrometers, and the 2nd one or more fields might be included and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0161]An invention of the 131st of this invention, The 1st average dislocation density. It is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a semiconductor substrate, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0162]An invention of the 132nd of this invention, By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An element region was demarcated on a semiconductor substrate so that an interval of the 2nd field might be not less than 50 micrometers, and the 2nd one or more fields might be included and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0163]An invention of the 133rd of this invention, The 1st average defect density. It is

the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which it has have arranged regularly mutually in parallel grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a semiconductor substrate, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0164]An invention of the 134th of this invention, By growing up a semiconductor layer by which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form light emitting element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor light emitting element which manufactured a semiconductor light emitting element, An element region was demarcated on a semiconductor substrate so that an interval of the 2nd field might be not less than 50 micrometers, and the 2nd one or more fields might be included and the 2nd field might not be included in a luminous region of a semiconductor light emitting element.

[0165]The 135th invention of this invention is the semiconductor light emitting element a semiconductor layer which forms light emitting element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a semiconductor substrate, and the 2nd field is not included in a luminous region of a semiconductor light emitting element.

[0166]An invention of the 136th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a semiconductor substrate arranged regularly. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device and the 2nd field might not be included in an active region of a semiconductor device.

[0167]The 137th invention of this invention is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st

average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly grew up to be, 2nd at least one field exists in an inside, the end face, or a corner of a semiconductor substrate, and the 2nd field is not included in an active region of a semiconductor device.

[0168]An invention of the 138th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a semiconductor substrate arranged regularly. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device and the 2nd field might not be included in an active region of a semiconductor device.

[0169]The 139th invention of this invention is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly grew up to be, 2nd at least one field exists in an inside, the end face, or a corner of a semiconductor substrate, and the 2nd field is not included in an active region of a semiconductor device.

[0170]An invention of the 140th of this invention, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, An element region was demarcated so that the 2nd field might not be included in an active region of a semiconductor device.

[0171]An invention of the 141st of this invention is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, 2nd at least one field exists in an inside, the end face, or a corner of a semiconductor substrate, and the 2nd field is not included in an active region of a semiconductor device.

[0172]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 142nd of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method

of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a semiconductor substrate so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the 2nd field might not be included in an active region of a semiconductor device.

[0173]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 143rd of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a semiconductor substrate seven or more, and the 2nd field is not included in an active region of a semiconductor device.

[0174]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 144th of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a semiconductor substrate so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the 2nd field might not be included in an active region of a semiconductor device.

[0175]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 145th of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a semiconductor substrate seven or more, and

the 2nd field is not included in an active region of a semiconductor device.

[0176]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 146th of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a semiconductor substrate so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the 2nd field might not be included in an active region of a semiconductor device.

[0177]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 147th of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a semiconductor substrate seven or more, and the 2nd field is not included in an active region of a semiconductor device.

[0178]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 148th of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, and the 1st interval is not less than 50 micrometers, An element region was demarcated on a semiconductor substrate so that a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in an active region of a semiconductor device.

[0179]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 149th of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate

regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a semiconductor substrate one or more, and the 2nd field is not included in an active region of a semiconductor device.

[0180]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 150th of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, and the 1st interval is not less than 50 micrometers, An element region was demarcated on a semiconductor substrate so that a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in an active region of a semiconductor device.

[0181]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 151st of this invention regularly at the 1st interval in the 1st direction, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a semiconductor substrate one or more, and the 2nd field is not included in an active region of a semiconductor device.

[0182]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 152nd of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of a semiconductor device which manufactured a semiconductor device by growing up a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, and the 1st interval is not less than 50 micrometers, An element region was demarcated on a semiconductor substrate so that a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in an active region of a semiconductor device.

[0183]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 153rd of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a semiconductor substrate one or more, and the 2nd field is not included in an active region of a semiconductor device.

[0184]An invention of the 154th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a semiconductor substrate arranged regularly mutually in parallel. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in an active region of a semiconductor device.

[0185]An invention of the 155th of this invention, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly mutually in parallel grew up to be, The 2nd seven or more fields are not substantially included in a semiconductor substrate, and the 2nd field is not included in an active region of a semiconductor device.

[0186]An invention of the 156th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a semiconductor substrate arranged regularly mutually in parallel. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in an active region of a semiconductor device.

[0187]An invention of the 157th of this invention, It is the semiconductor device a

semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly mutually in parallel grew up to be, The 2nd seven or more fields are not substantially included in a semiconductor substrate, and the 2nd field is not included in an active region of a semiconductor device.

[0188]An invention of the 158th of this invention, By growing up a semiconductor layer by which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a semiconductor substrate arranged regularly mutually in parallel. An element region was demarcated on a semiconductor substrate so that it might be a manufacturing method of a semiconductor device which manufactured a semiconductor device, and the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in an active region of a semiconductor device.

[0189]The 159th invention of this invention is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, The 2nd seven or more fields are not substantially included in a semiconductor substrate, and the 2nd field is not included in an active region of a semiconductor device.

[0190]An invention of the 160th of this invention, By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and an interval of the 2nd field is not less than 50 micrometers, An element region was demarcated on a semiconductor substrate so that the 2nd one or more fields might be included and the 2nd field might not be included in an active region of a semiconductor device.

[0191]An invention of the 161st of this invention, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists

of a crystal which has the 1st average dislocation density have arranged regularly mutually in parallel grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a semiconductor substrate, and the 2nd field is not included in an active region of a semiconductor device.

[0192]An invention of the 162nd of this invention, By growing up a semiconductor layer by which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and an interval of the 2nd field is not less than 50 micrometers, An element region was demarcated on a semiconductor substrate so that the 2nd one or more fields might be included and the 2nd field might not be included in an active region of a semiconductor device.

[0193]An invention of the 163rd of this invention, It is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly mutually in parallel grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a semiconductor substrate, and the 2nd field is not included in an active region of a semiconductor device.

[0194]An invention of the 164th of this invention, By growing up a semiconductor layer by which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a semiconductor substrate arranged regularly mutually in parallel. It is a manufacturing method of a semiconductor device which manufactured a semiconductor device, and an interval of the 2nd field is not less than 50 micrometers, An element region was demarcated on a semiconductor substrate so that the 2nd one or more fields might be included and the 2nd field might not be included in an active region of a semiconductor device.

[0195]The 165th invention of this invention is the semiconductor device a semiconductor layer which forms element structure on a semiconductor substrate which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, An interval of the 2nd field is not less than 50 micrometers, and

the 2nd one or more fields are included in a semiconductor substrate, and the 2nd field is not included in an active region of a semiconductor device.

[0196]An invention of the 166th of this invention, It is a manufacturing method of an element which manufactured an element by growing up a layer in which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a substrate arranged regularly, An element region was demarcated on a substrate so that the 2nd field might not be included in an active region of an element.

[0197]The 167th invention of this invention is the grown-up element, and a layer which forms element structure on a substrate which two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly An inside of a substrate, 2nd at least one field exists in the end face or a corner, and the 2nd field is not included in an active region of an element.

[0198]An invention of the 168th of this invention, It is a manufacturing method of an element which manufactured an element by growing up a layer in which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a substrate arranged regularly, An element region was demarcated on a substrate so that the 2nd field might not be included in an active region of an element.

[0199]The 169th invention of this invention is the grown-up element, and a layer which forms element structure on a substrate which two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly An inside of a substrate, 2nd at least one field exists in the end face or a corner, and the 2nd field is not included in an active region of an element.

[0200]An invention of the 170th of this invention is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate which two or more 2nd fields where crystallinity is worse than this 1st field have arranged regularly all over the 1st field that consists of crystals, An element region was demarcated so that the 2nd field might not be included in an active region of an element.

[0201]An invention of the 171st of this invention is the element a layer which forms element structure on a substrate which two or more 2nd fields where crystallinity is

worse than this 1st field have arranged regularly all over the 1st field that consists of crystals grew up to be, 2nd at least one field exists in an inside, the end face, or a corner of a substrate, and the 2nd field is not included in an active region of an element.

[0202]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 172nd of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a substrate so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the 2nd field might not be included in an active region of an element.

[0203]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 173rd of this invention regularly at the 1st interval in the 1st direction, It is the element a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a substrate seven or more, and the 2nd field is not included in an active region of an element.

[0204]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 174th of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a substrate so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the 2nd field might not be included in an active region of an element.

[0205]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 175th of this invention regularly at the 1st interval in the 1st direction, It is the element a layer which forms element

structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a substrate seven or more, and the 2nd field is not included in an active region of an element.

[0206]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 176th of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a substrate so that a sequence of the 2nd field of the 2nd direction might not be included seven or more substantially and the 2nd field might not be included in an active region of an element.

[0207]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 177th of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is the element a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, A sequence of the 2nd field of the 2nd direction is not substantially included in a substrate seven or more, and the 2nd field is not included in an active region of an element.

[0208]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 178th of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a substrate so that the 1st interval might be not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in an active region of an element.

[0209]Two or more 2nd fields that have the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density arrange an invention of the 179th of this

invention regularly at the 1st interval in the 1st direction, It is the element a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a substrate one or more, and the 2nd field is not included in an active region of an element.

[0210]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 180th of this invention regularly at the 1st interval in the 1st direction, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a substrate so that the 1st interval might be not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in an active region of an element.

[0211]Two or more 2nd fields that have the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density arrange an invention of the 181st of this invention regularly at the 1st interval in the 1st direction, It is the element a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a substrate one or more, and the 2nd field is not included in an active region of an element.

[0212]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 182nd of this invention regularly at the 1st interval in the 1st direction all over the 1st field that consists of crystals, It is a manufacturing method of an element which manufactured an element by growing up a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly, An element region was demarcated on a substrate so that the 1st interval might be not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction might be included one or more and the 2nd field might not be included in an active region of an element.

[0213]Two or more 2nd fields where crystallinity is worse than this 1st field arrange an invention of the 183rd of this invention regularly at the 1st interval in the 1st direction

all over the 1st field that consists of crystals, It is the element a layer which forms element structure on a substrate regularly arranged at the 2nd interval smaller than the 1st interval in the 1st direction and the 2nd direction that intersects perpendicularly grew up to be, The 1st interval is not less than 50 micrometers, and a sequence of the 2nd field of the 2nd direction is included in a substrate one or more, and the 2nd field is not included in an active region of an element.

[0214]An invention of the 184th of this invention, By growing up a layer in which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a substrate arranged regularly mutually in parallel. An element region was demarcated on a substrate so that it might be a manufacturing method of an element which manufactured an element, and the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in an active region of an element.

[0215]An invention of the 185th of this invention, It is the element a layer which forms element structure on a substrate which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly mutually in parallel grew up to be, The 2nd seven or more fields are not substantially included in a substrate, and the 2nd field is not included in an active region of an element.

[0216]An invention of the 186th of this invention, By growing up a layer in which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a substrate arranged regularly mutually in parallel. An element region was demarcated on a substrate so that it might be a manufacturing method of an element which manufactured an element, and the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in an active region of an element.

[0217]An invention of the 187th of this invention, It is the element a layer which forms element structure on a substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly mutually in parallel grew up to be, The 2nd seven or more fields are not substantially included in a substrate, and the 2nd field is not included in an active region of an element.

[0218]An invention of the 188th of this invention, It is a manufacturing method of an element which manufactured an element by growing up a layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a substrate arranged regularly mutually in parallel, An element region was demarcated on a substrate so that the 2nd seven or more fields might not be included substantially and the 2nd field might not be included in an active region of an element.

[0219]The 189th invention of this invention is the element a layer which forms element structure on a substrate which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, The 2nd seven or more fields are not substantially included in a substrate, and the 2nd field is not included in an active region of an element.

[0220]An invention of the 190th of this invention, By growing up a layer in which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density form element structure on a substrate arranged regularly mutually in parallel. An element region was demarcated on a substrate so that might be a manufacturing method of an element which manufactured an element, an interval of the 2nd field might be not less than 50 micrometers, and the 2nd one or more fields might be included and the 2nd field might not be included in an active region of an element.

[0221]An invention of the 191st of this invention, It is the element a layer which forms element structure on a substrate which two or more 2nd fields that extend in linear shape which has the 2nd average dislocation density higher than the 1st average dislocation density all over the 1st field that consists of a crystal which has the 1st average dislocation density have arranged regularly mutually in parallel grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a substrate, and the 2nd field is not included in an active region of an element.

[0222]An invention of the 192nd of this invention, By growing up a layer in which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density form element structure on a substrate arranged regularly mutually in parallel. An element region was demarcated on a substrate so that might be a manufacturing method of an element which manufactured an element, an

interval of the 2nd field might be not less than 50 micrometers, and the 2nd one or more fields might be included and the 2nd field might not be included in an active region of an element.

[0223]An invention of the 193rd of this invention, It is the element a layer which forms element structure on a substrate which two or more 2nd fields that extend in linear shape which has the 2nd average defect density higher than the 1st average defect density all over the 1st field that consists of a crystal which has the 1st average defect density have arranged regularly mutually in parallel grew up to be, An interval of the 2nd field is not less than 50 micrometers, and the 2nd one or more fields are included in a substrate, and the 2nd field is not included in an active region of an element.

[0224]An invention of the 194th of this invention, It is a manufacturing method of an element which manufactured an element by growing up a layer in which two or more 2nd fields where crystallinity extends in bad linear shape from this 1st field all over the 1st field that consists of crystals form element structure on a substrate arranged regularly mutually in parallel, An element region was demarcated on a substrate so that an interval of the 2nd field might be not less than 50 micrometers, and the 2nd one or more fields might be included and the 2nd field might not be included in an active region of an element.

[0225]The 195th invention of this invention is the element a layer which forms element structure on a substrate which two or more 2nd fields that extend in linear shape with worse crystallinity than this 1st field have arranged regularly mutually in parallel all over the 1st field that consists of crystals grew up to be, and an interval of the 2nd field is not less than 50 micrometers, The 2nd one or more fields are included in a substrate, and the 2nd field is not included in an active region of an element.

[0226]In the 46th - the 51 of this invention, the 76th - the 81, the 106th - the 111, the 136th - the 141, the 166th - the 171st invention, unless it is contrary to that character, having stated in relation to the 1st of this invention - the 45th invention is materialized.

[0227]In the 52nd - the 57 of this invention, the 64th - the 69, the 82nd - the 87, the 94th - the 99, the 112nd - the 117, the 124th - the 129, the 142nd - the 147, the 154th - the 159, the 172nd - the 177, the 184th - the 189th invention, An interval of the 2nd field that extends in an interval (the 1st interval) of the 2nd field of the 1st direction or linear shape is the same as that of an interval of the 2nd field or an arrangement interval of the 2nd field described in relation to an invention of the 1st of this invention. In the 58th - the 63 of this invention, the 70th - the 75, the 88th - the 93, the 100th - the 105, the 118th - the 123, the 130th - the 135, the 148th - the 153, the 160th - the 165, the 178th - the 183rd invention, An interval of the 2nd field that extends in an interval (the 1st

interval) of the 2nd field of the 1st direction or linear shape is the same as that of an interval of the 2nd field or an arrangement interval of the 2nd field described in relation to an invention of the 1st of this invention except for a minimum being 50 micrometers. In the 52nd - the 63 of this invention, the 82nd - the 93, the 112nd - the 123, the 142nd - the 153, the 172nd - the 183rd invention, an interval of the 2nd field of the 2nd direction, It can choose freely in the range smaller than the 1st interval fundamentally, and is a thing, and although based also on a size of the 2nd field, generally not less than 10 micrometers 1000 micrometers or less are not less than 20 micrometers 200 micrometers or less typically.

[0228]In the 52nd - the 57 of this invention, the 64th - the 69, the 82nd - the 87, the 94th - the 99, the 112nd - the 117, the 124th - the 129, the 142nd - the 147, the 154th - the 159, the 172nd - the 177, the 184th - the 189th invention, Having made into seven a number of the 2nd field of maximums which extend in a sequence of the 2nd field of the 2nd direction or linear shape, It takes into consideration that about seven may be contained by a relation with a chip size of an element in an element region depending on an interval of the 2nd field that extends in a sequence of the 2nd field of the 2nd direction, or linear shape. Generally the number of the 2nd fields that extend in a sequence of the 2nd field of this 2nd direction or linear shape is three or less typically in a semiconductor light emitting element with a small chip size.

[0229]In the 46th of this invention - the 195th invention, unless anythings other than the above are contrary to that character, having stated in relation to the 1st of this invention - the 45th invention is materialized.

[0230]In this invention constituted as mentioned above, So that the 2nd field where crystallinity is bad may not be included substantially highly [average defect density] more highly [average dislocation density] than the 1st field, Or since he is trying to demarcate an element region on a nitride system group-III-V-semiconducter board, a semiconductor substrate, or a substrate so that the 2nd field may not be included in an active region of an element, Even if defects, such as a rearrangement, spread from the 2nd field in a nitride system group-III-V-semiconducter layer which forms light emitting element structure or element structure, a semiconductor layer, or a layer which consists of various kinds of materials, Defects, such as a rearrangement, can be prevented from almost existing in a chip obtained by scribing of a substrate.

[0231]

[Embodiment of the Invention]Hereafter, it explains, referring to drawings for the embodiment of this invention. In the complete diagram of an embodiment, the same numerals are given to the portion which is the same or corresponds. In following

embodiments, as shown in drawing 1 A, the case where the field B where crystallinity differs with the crystal forms a semiconductor device on it by using as a substrate what is periodically arranged to island shape all over the field A which consists of a certain crystal is explained. The field B has penetrated the substrate. The field B assumes that crystallinity is bad and includes more crystal defects from the field A. The sectional view of the maximum approaching direction of the field B is shown in drawing 1 B. here -- the field B -- unfixed diversification -- although it is common to have pillar-shaped shape, in drawing 1 A, it simplifies and is considered as cylindrical shape (the following -- the same). In order to manufacture a semiconductor laser, the semiconductor layer which forms element structure is grown up one by one on this substrate, for example with organometal chemistry vapor phase epitaxy (MOCVD), hydride vapor phase epitaxial growth, or halide vapor phase epitaxial growth (HVPE). Then, a semiconductor device is manufactured by performing required processes, such as formation of an electrode, and cleavage's etc. performing scribing of a substrate and the semiconductor layer on it, and carrying out chip making further.

[0232]Since the crystal defect of a substratum substrate spreads also to the semiconductor layer which grows on it at this time, the semiconductor device formed in the element region where the field B is included becomes that in which the characteristic was inferior in response to the influence of that defect. For example, in the case of a light emitting diode or a semiconductor laser, if a defect exists in a luminous region, a luminescent characteristic and reliability will be spoiled remarkably. Then, the following techniques are taken so that a luminous region and the adverse effect more generally according [an active region] to the field B may not be received.

[0233](1) Design the size of an element according to the cycle in which the field B exists. For example, as shown in drawing 2, the field B has arranged periodically by regular intervals to the shape of a hexagonal lattice, and an element region is made into the rectangle of 400 micrometers x 346 micrometers when the interval of the centers of the field B of the maximum contiguity is 400 micrometers. The numerical value of these 346 micrometers is 400micrometerx ($3^{1/2}/2$).

[0234](2) If it puts in another way so that an element region may not be substantially formed on the field B, it will opt for arrangement of the element region on the substrate so that an element region may not include the field B substantially. For example, chip making of the element region which is a rectangle of 400 micrometers x 346 micrometers is separated and carried out by performing scribing of a substrate along the line shown in a dashed line in drawing 3. By doing in this way, the field B comes to exist only in each chip, i.e., the end face of each semiconductor device, and a corner.

[0235](3) Design the position of the active region in an element so that the active region inside an element may not be formed on the field B. For example, since a luminous region is the shape of stripe shape in many cases in the case of a semiconductor laser, the structure of a semiconductor laser is designed so that the stripe may not be formed on the field B. An example of such a stripe position is shown in drawing 4.

[0236]With the technique stated to the above (1) - (3), each element region can be arranged to arrangement which avoids intentionally the influence of the field B with many defects. In addition to the above-mentioned thing, especially in the case of a semiconductor laser, the design of an element region or element structure is performed so that the resonator edge face of a luminous region may not be formed on the field B. The characteristic of laser will be spoiled, if the portion used as the mirror of the resonator is formed on the field B with many crystal defects as shown in drawing 5 since the end face of a chip is used as a resonator edge face in a semiconductor laser. For this reason, the position of a luminous region and arrangement of the element region on a substrate are designed so that the mirror part of a resonator may not be formed on the field B. In above (1), the rectangle of 400 micrometers x 346 micrometers is an example, and the size and shape of an element should just be chosen so that the conditions stated to (2) and (3) may be fulfilled.

[0237]Now, a 1st embodiment of this invention is described. In this 1st embodiment, the case where the field B which consists of a crystal with high average dislocation density into the field A which consists of a crystal with low average dislocation density grows up a GaN system semiconductor layer, and forms a GaN system semiconductor laser on the GaN board arranged regularly is explained.

[0238]Drawing 6 is a top view showing the GaN board used in this 1st embodiment. The perspective view and sectional view of this GaN board 1 are the same as that of drawing 1 A and drawing 1 B. This GaN board 1 is a field (0001) (C side) direction in a n type. However, the GaN board 1 may be a thing of R side, A side, or M plane direction. In this GaN board 1, the field B which consists of a crystal with high average dislocation density into the field A which consists of a crystal with low average dislocation density has arranged periodically in the shape of a hexagonal lattice. In this case, the straight line which connects field B of the maximum contiguity is in agreement with the <1-100> direction of GaN, and a direction equivalent to it. However, the straight line which connects field B of the maximum contiguity may be made in agreement with the <11-20> direction of GaN, and a direction equivalent to it. The field B has penetrated the GaN board 1. The thickness of this GaN board 1 is 200-600 micrometers. the dashed line of drawing 6 is for showing the relative physical

relationship of the field B, and is not a line (a physical meaning -- it is) which exists really (the following -- the same).

[0239]The array cycle (interval of the centers of the field B of the maximum contiguity) of the field B is 400 micrometers, and the diameter is 20 micrometers. The average dislocation density of for example, $2x10^{6}cm^{-2}$ and the field B of the average dislocation density of the field A is for example, $1x10^{8}cm^{-2}$. An example of distribution of radial dislocation density is shown in drawing 7 from the center of the field B. This GaN board 1 can be manufactured as follows, using crystal growth art. The fundamental crystal growth mechanism used for manufacture of this GaN board 1 makes a rearrangement spread by having a slant face which consists of facet surfaces, growing up it, maintaining that facet surface slant face and growing up it, and gathers a position. The field grown-up according to this facet surface turns into a defect region of low density by movement of a rearrangement. It has a high-density defect region with a clear boundary, and growth is performed, and rearrangements gather to the boundary of a high-density defect region, or its inside, and are disappeared or accumulated in the facet surface slant-face lower part here. The shape of a facet surface also changes with shape of this high-density defect region. When a defect region is dot form, facet surfaces surround by using the dot as a bottom, and the pit which consists of facet surfaces is formed. When a defect region is stripe shape, by using a stripe as the bottom of a valley, it has a facet surface slant face on the both sides, and becomes a facet surface of the shape of prism of the triangle pushed down horizontally. Then, by giving grinding and polish on the surface of a growth phase, flattening of the surface can be carried out and it can be considered as the gestalt which can be used as a substrate. The above-mentioned high-density defect region may have some states. For example, it may consist of polycrystals. Although it is a single crystal, it may fine-incline to a surrounding low density defect region. C axis may be reversed to a surrounding low density defect region. In this way, this high-density defect region has a clear boundary, and is distinguished the surroundings. Without embedding the facet surface around it by having this high-density defect region and growing up it, a facet surface can be maintained and growth can be gone on. This high-density defect region can be generated by forming the seed in the place which forms a high-density defect region beforehand, when carrying out crystal growth of the GaN on a substratum substrate. As the kind, amorphous or the layer of polycrystal is formed. Moreover, a high-density defect region can be exactly formed in the kind of field by growing up GaN. The concrete manufacturing method of this GaN board 1 is as follows. First, a substratum substrate is prepared. Although various substrates can be used as this substratum

substrate and general silicon on sapphire may be sufficient, when it takes removing by a post process into consideration, it is preferred to use the GaAs substrate etc. which are easy to remove. And the kind which consists of a SiO_2 film, for example is formed on this substratum substrate. This kind of shape can be made into dot form or stripe shape, for example. This kind is regular and can be formed. [many] More specifically, a seed is formed in this case by the arrangement corresponding to arrangement of the field B shown in drawing 6. Then, for example, thick film growth of the GaN is carried out by hydride vapor phase epitaxy (HVPE). The facet surface according to the pattern shape of the seed is formed in the surface of the thick film layer of GaN after growth. When a seed is a dot form pattern like this 1st embodiment, the pit which consists of facet surfaces is formed regularly. On the other hand, when a seed is a pattern of stripe shape, a prism-like facet surface is formed. then -- removing a substratum substrate -- further -- the thick film layer of GaN -- a grinding process -- polishing work is carried out and flattening of the surface is carried out. The GaN board 1 can be manufactured by this. Here, the thickness of the GaN board 1 can be set up freely. Thus, C side is the principal surface and the manufactured GaN board 1 is the substrate with which the dot form (or stripe shape) high-density defect region B of predetermined size, i.e., a field, was regularly formed into it. Compared with the field B, single crystal regions A other than the field B, i.e., a field, serve as low dislocation density.

[0240]In this 1st embodiment, the element region 2 (lot surrounded as the thick solid line) is demarcated by shape and arrangement as shown in drawing 7 on the GaN board 1 shown in drawing 6. And the GaN system semiconductor layer which forms laser structure on the GaN board 1 is grown up, After performing required processes, such as formation of a laser stripe, and formation of an electrode, and forming laser structure, it separates into each GaN system semiconductor laser chip by performing scribing of the GaN board 1 with which laser structure was formed along the border line of an element region.

[0241]In drawing 8, the GaN system semiconductor laser whose gray rectangle is one is expressed, the straight line drawn near [the] the center is the laser stripe 3, and this is equivalent to the position of a luminous region. The rectangle drawn with the dashed line with which they stood in a row expresses the laser bar 4, and the long side of this laser bar 4 is equivalent to a resonator edge face.

[0242]In the example shown in drawing 8, the sizes of a GaN system semiconductor laser are 600 micrometers x 346 micrometers, A transverse direction (long side direction) divides a lengthwise direction (short side direction) into the GaN system semiconductor laser of the size by performing scribing of a substrate, respectively along

the straight line which does not pass along the field B along the straight line which connects the field B.

[0243]In this case, since the field B will exist only in the end face section of the long side of each GaN system semiconductor laser, it is avoidable that the influence of the field B reaches a luminous region by designing an element so that the laser stripe 3 may be located near the straight line which connects the middle points of a shorter side. Although formed in the end face by performing scribing of a substrate by cleavage etc. along the straight line of the lengthwise direction in drawing 8 about the mirror of a resonator, since the straight line does not pass along the field B, it is not influenced by the rearrangement in the field B. Therefore, a GaN system semiconductor laser good a luminescent characteristic and reliable can be obtained.

[0244]It is as follows when an example of a concrete structure of a GaN system semiconductor laser and a manufacturing process is given. Here, the GaN system semiconductor laser which has ridge structure and SCH (Separate ConfinementHeterostructure) structure is explained.

[0245]Namely, first, as shown in drawing 9, after defecating the surface of the GaN board 1 by thermal cleaning etc., on it by the MOCVD method. N type GaN buffer layer 5, the n type AlGaN clad layer 6, the n type GaN lightguide 7, the active layer 8 of undoped $Ga_{1-x}In_xN/Ga_{1-y}In_yN$ multiple quantum well structure, the undoped InGaN deterioration prevention layer 9, The p type AlGaN cap layer 10, the p type GaN lightguide 11, the p type AlGaN clad layer 12, and the p type GaN contact layer 13 are grown epitaxially one by one.

[0246]Here, as for n type GaN buffer layer 5, thickness is 0.05 micrometer and Si is doped as a n type impurity. Thickness is 1.0 micrometer, Si is doped as a n type impurity and the Al composition of the n type AlGaN clad layer 6 is 0.08. As for the n type GaN lightguide 7, thickness is 0.1 micrometer and Si is doped as a n type impurity. The active layer 8 of undoped $In_xGa_{1-x}N/In_yGa_{1-y}N$ multiple quantum well structure, For example, x= 0.14 and the $In_yGa_{1-y}N$ layer thickness as a barrier layer are [y= 0.02 and the number of wells of the $In_xGa_{1-x}N$ layer thickness as a well layer] 3 in 7 nm at 3.5 nm.

[0247]The undoped InGaN deterioration prevention layer 9 from the field which is in contact with the active layer 8, It has the gray DIDDO structure in which In presentation carries out monotone decreasing gradually toward the field which is in contact with the p type AlGaN cap layer 9, In presentation in the field which is in contact with the active layer 8 is in agreement with the In presentation y of the $In_yGa_{1-y}N$ layer as a barrier layer of the active layer 8, and In presentation in the field which is in contact with the p

type AlGaN cap layer 10 has become 0. The thickness of this undoped InGaN deterioration prevention layer 9 is 20 nm.

[0248]As for the p type AlGaN cap layer 10, thickness is 10 nm and magnesium (Mg) is doped as a p type impurity. The Al composition of this p type AlGaN cap layer 10 is 0.2. While preventing that In is desorbed from the active layer 8 at the time of growth of the p type GaN lightguide 11, the p type AlGaN clad layer 12, and the p type GaN contact layer 13, and this p type AlGaN cap layer 10 deteriorates, It is for preventing overflow of the career (electron) from the active layer 8. As for the p type GaN lightguide 11, thickness is 0.1 micrometer and Mg is doped as a p type impurity. Thickness is 0.5 micrometer, Mg is doped as a p type impurity and the Al composition of the p type AlGaN clad layer 12 is 0.08. As for the p type GaN contact layer 13, thickness is 0.1 micrometer and Mg is doped as a p type impurity.

[0249].In. The growing temperature of n type GaN buffer layer 5 which is a layer which is not included, the n type AlGaN clad layer 6, the n type GaN lightguide 7, the p type AlGaN cap layer 10, the p type GaN lightguide 11, the p type AlGaN clad layer 12, and the p type GaN contact layer 13 shall be about 1000 **, Growing temperature of the active layer 8 of the $Ga_{1-x}In_xN/Ga_{1-y}In_yN$ multiple quantum well structure which is a layer containing In is made into 700-800 **, for example, 730 **. The growing temperature of the undoped InGaN deterioration prevention layer 9 sets it at the growth start time as 730 ** as well as the growing temperature of the active layer 8, and is raised after that, for example, linearly, and it is it at the end time of growth, and is made to be 835 ** as well as the growing temperature of the p type AlGaN cap layer 10.

[0250]The growth material of these GaN system semiconductor layers is trimethylgallium (CH_3) (it $_3$-Ga(s) and) as a raw material of Ga, for example. As a raw material of TMG and aluminum, trimethylindium (CH_3) ($_3$ In, TMI) is used as trimethylaluminum (CH_3) ($_3$aluminum, TMA) and a raw material of In, and NH_3 is used as a raw material of N. As carrier gas, H_2 is used, for example. About a dopant, as a n type dopant, for example, a mono silane (SiH_4), As a p type dopant, screw = methylcyclopentadienyl magnesium ($CH_3C_5H_4$) ($_2$Mg) or screw = magnesium cyclopentadienyl (C_5H_5) ($_2$Mg) is used.

[0251]Next, the GaN board 1 into which the GaN system semiconductor layer was grown up as mentioned above is picked out from an MOCVD system. All over the p type GaN contact layer 13, and for example, a CVD method, a vacuum deposition method, By sputtering process etc., for example, after forming a 0.1-micrometer-thick SiO_2 film (not shown), Form the resist pattern (not shown) of the specified shape corresponding to the shape of the ridge part with lithography on this SiO_2 film, and this

resist pattern is used as a mask, For example, a SiO_2 film is etched by the RIE method using the etching gas containing fluoride, such as the wet etching using an etching reagent or CF_4 of a fluoric acid system, and CHF_3, and it is considered as the shape corresponding to a ridge part.

[0252]Next, by etching by the RIE method by using this SiO_2 film as a mask by predetermined Mr. Fukashi of the thickness direction of the p type AlGaN clad layer 12, as shown in drawing 10, the ridge 14 which extends in the <1-100> direction is formed. The width of this ridge 14 is 3 micrometers. Chlorine system gas is used as etching gas of this RIE.

[0253]Next, after carrying out etching removal of the SiO_2 film used as an etching mask, the insulator layer 15 like a 0.3-micrometer-thick SiO_2 film is formed by CVD method, vacuum deposition method, sputtering process, etc. to an entire substrate. This insulator layer 15 is a thing for electric insulation and a surface protection.

[0254]Next, a wrap resist pattern (not shown) is formed for the surface of the insulator layer 15 of the field except p lateral electrode formation area with lithography. Next, the opening 15a is formed by etching the insulator layer 15 by using this resist pattern as a mask.

[0255]Next, in the state where it has left the resist pattern, after forming for example, Pd film, a Pt film, and Au membrane in an entire substrate one by one with a vacuum deposition method, a resist pattern is removed with Pd film, the Pt film, and Au membrane which were formed on it (lift off). The p lateral electrode 16 which contacted the p type GaN contact layer 13 through the opening 15a of the insulator layer 15 by this is formed. Here, the thickness of Pd film which constitutes this p lateral electrode 16, a Pt film, and Au membrane shall be 10 nm, 100 nm, and 300 nm, respectively, for example. Next, alloy treatment for carrying out ohmic contact of the p lateral electrode 16 is performed.

[0256]Next, a Ti film, a Pt film, and Au membrane are formed in the rear face of the GaN board 1 one by one with a vacuum deposition method, and the n lateral electrode 17 of Ti/Pt/Au structure is formed. Here, the thickness of the Ti film which constitutes this n lateral electrode 17, a Pt film, and Au membrane shall be 10 nm, 50 nm, and 100 nm, respectively, for example. Next, alloy treatment for carrying out ohmic contact of the n lateral electrode 17 is performed.

[0257]Next, cleavage performs scribing of the GaN board 1 with which laser structure was formed as mentioned above along the border line of the element region 2, it is processed into the laser bar 4, and both resonator edge faces are formed. Next, after performing edge face coating to these resonator edge faces, again, cleavage etc. perform

scribing of this laser bar 4, and chip making is carried out. The GaN system semiconductor laser which has the ridge structure and SCH structure which are made into the purpose by the above as shown in drawing 11 is manufactured.

[0258]As mentioned above, after according to this 1st embodiment demarcating the element region 2 so that the field B where average dislocation density is high may not include the field B substantially in the field A where average dislocation density is low on the GaN board 1 periodically arranged in the shape of a hexagonal lattice, Even if defects, such as a rearrangement, spread from the field B of the GaN board 1 to this GaN system semiconductor layer, that influence can be prevented from attaining to the GaN system semiconductor layer on the element region 2, since the GaN system semiconductor layer which forms laser structure on this GaN board 1 is grown up. And after growing up a GaN system semiconductor layer and performing formation of formation of the ridge 14, the p lateral electrode 16, and the n lateral electrode 17, etc., Since it has separated into each GaN system semiconductor laser chip by performing scribing of the GaN board 1 with which laser structure was formed along the border line of the element region 2, the rearrangement succeeded from the GaN board 1 hardly exists in this GaN system semiconductor laser chip. For this reason, a luminescent characteristic is good and reliability can realize a long lasting high GaN system semiconductor laser.

[0259]In addition, since according to this 1st embodiment the undoped InGaN deterioration prevention layer 9 is formed in contact with the active layer 8 and the p type AlGaN cap layer 10 is formed in contact with this undoped InGaN deterioration prevention layer 9, While being able to ease substantially the stress generated in the active layer 8 by the p type AlGaN cap layer 10 by the undoped InGaN deterioration prevention layer 9, it can control effectively that Mg used as a p type dopant of a p type layer is spread in the active layer 7.

[0260]Next, a 2nd embodiment of this invention is described. As shown in drawing 12, unlike a 1st embodiment, in this 2nd embodiment, the border line of the rectangular element region 2 consists of a straight line which connects the centers of the field B also to that long side and shorter side. Also in this case, the position of the laser stripe 3 is carried out the line top which connects the middle points of the shorter side of the element region 2. By carrying out like this, it is avoidable that the influence of the field B reaches a luminous region.

[0261]In this 2nd embodiment, that the mirror of a resonator is formed differs from a 1st embodiment by performing scribing by cleavage along the border line of the element region 2 which consists of a straight line which connects the centers of the field B. Here,

since the field B has many rearrangements, it is thought that it is easier to break than the field A. Therefore, if scribing is performed along the straight line which connects field B, so to speak, as for the portion of the field A, cleavage of the field B will be finely carried out sure enough in a role like perforations. Under the present circumstances, since the end face of the portion of the field B has many rearrangements, it does not necessarily become flat, but the end face of the portion of the field A in the meantime becomes flat. The shape of the end face is notionally shown in drawing 13.

[0262]Although it is an end face section of the laser stripe 2 that surface smoothness is needed, if it is arrangement as shown in drawing 12, the end face of the portion of the field B does not have ****** in a luminescent characteristic etc. in an adverse effect. Since things other than the above are the same as that of a 1st embodiment, explanation is omitted. Also by this 2nd embodiment, the same advantage as a 1st embodiment can be acquired.

[0263]Next, a 3rd embodiment of this invention is described. In this 3rd embodiment, as shown in drawing 14, in the GaN board 1, the field B which consists of a crystal with high average dislocation density into the field A which consists of a crystal with low average dislocation density has arranged periodically in the shape of a rectangular grid. And the field B makes this one rectangle located in those four corners the element region 2. In this case, the straight line to which the straight line which connects field B of the maximum contiguity of a rectangular long side direction connects field B of the maximum contiguity of a short side direction in accordance with the <1-100> direction of GaN is in agreement with the <11-20> direction of GaN.

[0264]The array cycle of the field B of 600 micrometers and a short side direction of the array cycle of the field B of the long side direction of a rectangular grid is 400 micrometers, and the size of the element region 2 is set to 600 micrometers x 400 micrometers in this case. The laser stripe 3 of the element region 2 is carried out the straight-line top which connects the middle point of the neighborhood of the short side direction of a rectangular grid. Since things other than the above are the same as that of a 1st embodiment, explanation is omitted. Also by this 3rd embodiment, the same advantage as a 1st embodiment can be acquired.

[0265]Next, a 4th embodiment of this invention is described. In this 4th embodiment, as shown in drawing 15, it is the same as that of a 1st embodiment that the field B has arranged periodically in the shape of a hexagonal lattice in the field A of the GaN board 1, but. It differs from a 1st embodiment that the field C of the interim average dislocation density of the average dislocation density of the field A and the average dislocation density of the field B is formed as a transition region between the field A

and the field B. The average dislocation density of the field A specifically Below 2x10 $^{6}cm^{-2}$. The average dislocation density of the field C is lower than 1x10 $^{8}cm^{-2}$, and that of the average dislocation density of the field B is [more than 1x10 $^{8}cm^{-2}$] larger than 2x10 $^{6}cm^{-2}$. The array cycle (interval of the centers of the field B of the maximum contiguity) of the field B is 300 micrometers, and the diameter is 20 micrometers. The diameter of the field C is 120 micrometers.

[0266]In this case, unlike a 1st embodiment, the border line of the rectangular element region 2 consists of a straight line which connects the centers of the field B also to that long side and shorter side. The sizes of the element region 2 are 600 micrometers x 260 micrometers. Although the position of the laser stripe 3 is carried out also in this case the line top which connects the middle points of the shorter side of the element region 2, this laser stripe 3 does not include the field B and the field C. By carrying out like this, it is avoidable that the influence of the field B and the field C reaches a luminous region. Since things other than the above are the same as that of a 1st embodiment, explanation is omitted. Also by this 4th embodiment, the same advantage as a 1st embodiment can be acquired.

[0267]Next, a 5th embodiment of this invention is described. In this 5th embodiment, as shown in drawing 16, it is the same as that of a 1st embodiment that the field B has arranged periodically in the shape of a hexagonal lattice in the field A of the GaN board 1, but. It differs from a 1st embodiment that the field C of the interim average dislocation density of the average dislocation density of the field A and the average dislocation density of the field B is formed as a transition region between the field A and the field B. The average dislocation density of the field A specifically Below 2x10 $^{6}cm^{-2}$. The average dislocation density of the field C is lower than 1x10 $^{8}cm^{-2}$, and that of the average dislocation density of the field B is [more than 1x10 $^{8}cm^{-2}$] larger than 2x10 $^{6}cm^{-2}$. The array cycle (interval of the centers of the field B of the maximum contiguity) of the field B is 400 micrometers, and the diameter is 20 micrometers. The diameter of the field C is 120 micrometers.

[0268]In this case, in the 1st example, unlike a 1st embodiment, the border line of the short side direction of the rectangular element region 2 consists of a straight line which connects the centers of the field B, but the border line of the long side direction has separated 23 micrometers from the straight line which connects the centers of the field B of the maximum contiguity, for example. In this case, the sizes of the element region 2 are 400 micrometers x 300 micrometers. Although the position of the laser stripe 3 is carried out also in this case the line top which connects the middle points of the shorter side of the element region 2, this laser stripe 3 does not include the field B and the field

C. By carrying out like this, it is avoidable that the influence of the field B and the field C reaches a luminous region.

[0269]On the other hand in the 2nd example, the border line of the long side direction of the rectangular element region 2 has separated 23 micrometers from the straight line which connects the centers of the field B of the maximum contiguity of the <1-100> direction, for example, The border line of the short side direction has separated 100 micrometers from the straight line which connects the centers of the field B of the maximum contiguity of the <11-20> direction, for example. Also in this case, the sizes of the element region 2 are 400 micrometers x 300 micrometers. Although the position of the laser stripe 3 is carried out the line top which connects the middle points of the shorter side of the element region 2, this laser stripe 3 does not include the field B and the field C. By carrying out like this, it is avoidable that the influence of the field B and the field C reaches a luminous region. Since things other than the above are the same as that of a 1st embodiment, explanation is omitted. Also by this 5th embodiment, the same advantage as a 1st embodiment can be acquired.

[0270]Next, a 6th embodiment of this invention is described. Although it is the same as that of a 1st embodiment in this 6th embodiment that the field B has arranged periodically in the shape of a hexagonal lattice in the field A of the GaN board 1, In this case, as shown in drawing 17, the interval which connects the centers of the field B of the maximum contiguity of the <1-100> direction is set up the twice of the length of the shorter side of the rectangular element region 2, and it is specifically set as 700 micrometers. **1-100** The border line of the short side direction of this element region 2 of the field B of the maximum contiguity of a direction consists of a straight line which connects the centers of the field B of the maximum contiguity of the <11-20> direction, and the border line of a long side direction consists of a straight line which connects the centers of the field B of the maximum contiguity of the <1-100> direction. In this case, the sizes of the element region 2 are 606 micrometers x 350 micrometers. Although the position of the laser stripe 3 is carried out the line top which connects the middle points of the shorter side of the element region 2, this laser stripe 3 does not include the field B. By carrying out like this, it is avoidable that the influence of the field B reaches a luminous region. Since things other than the above are the same as that of a 1st embodiment, explanation is omitted. Also by this 6th embodiment, the same advantage as a 1st embodiment can be acquired.

[0271]Next, a 7th embodiment of this invention is described. As shown in drawing 18, in this 7th embodiment, the two laser stripes 3 of each other are formed in the element region 2 in parallel. The GaN system semiconductor laser chip obtained by performing

scribing along the border line of this element region 2 is shown in drawing 19. Since things other than the above are the same as that of a 1st embodiment, explanation is omitted. According to this 7th embodiment, in the GaN system semiconductor laser of a multi-beam, the same advantage as a 1st embodiment can be acquired.

[0272]Next, an 8th embodiment of this invention is described. As shown in drawing 20, in this 8th embodiment, it is the same as that of a 1st embodiment that the laser stripe 3 is formed in the element region 2, but the width of this laser stripe 3 is much greatly chosen in this case compared with a 1st embodiment. The width of this laser stripe 3 can make the length of the shorter side of the rectangular element region 2 maximum a-d, if the diameter of a and the field B is set to d, but specifically. Since it is desirable to separate at least 1 micrometers or more of laser stripes 3 from the field B, if this is taken into consideration, the maximum of the width of the laser stripe 3 will serve as a-d-2micrometer. For example, in being a= 346 micrometers and d= 20 micrometers, the maximum of the width of the laser stripe 3 serves as 2= 324 micrometers of 346-20-. If one example is given, the width of the laser stripe 3 will be 200 micrometers. At this time, the GaN system semiconductor laser chip obtained by performing scribing along the border line of the element region 2 is shown in drawing 21. Since things other than the above are the same as that of a 1st embodiment, explanation is omitted. According to this 8th embodiment, in the GaN system semiconductor laser of super-high power whose width of the laser stripe 3 is very large, the same advantage as a 1st embodiment can be acquired.

[0273]Next, a 9th embodiment of this invention is described. Drawing 22 is a top view showing the GaN board used in this 9th embodiment. As shown in drawing 22, in this 9th embodiment, the element region 2 is demarcated so that the field B may not be included in the laser stripe 3. Here, the laser stripe 3 has separated not less than 50 micrometers from the field B. In this case, the two fields B will be included in the element region 2. Since things other than the above are the same as that of a 1st embodiment, explanation is omitted. According to this 9th embodiment, the same advantage as a 1st embodiment can be acquired.

[0274]Next, a 10th embodiment of this invention is described. Drawing 23 is a top view showing the GaN board used in this 10th embodiment. This GaN board 1 is C plane direction in a n type. However, the GaN board 1 may be a thing of R side, A side, or M plane direction. The field B which consists of a crystal with high average dislocation density in this GaN board 1 into the field A which consists of a crystal with low average dislocation density arranges periodically for example, at intervals of 400 micrometers in the <11-20> direction of GaN, **11-20** It has arranged periodically at intervals of 20

- 100 micrometers in the <1-100> direction which intersects perpendicularly with a direction. However, the <11-20> direction and the <1-100> direction may be replaced.

[0275]In this 10th embodiment, as shown in drawing 24, the end face of a couple parallel to the laser stripe 3 passes along the sequence of the field B of the <1-100> direction, and the element region 2 is demarcated so that the laser stripe 3 may be located near the center of the field between the sequences of this field B. In this case, the sequence of the field B is not included substantially in the element region 2. Since things other than the above are the same as that of a 1st embodiment, explanation is omitted. According to this 10th embodiment, the same advantage as a 1st embodiment can be acquired.

[0276]Next, an 11th embodiment of this invention is described. As shown in drawing 25, in this 11th embodiment, use the same GaN board 1 as a 10th embodiment, but. It differs from a 10th embodiment in that the one end face parallel to the laser stripe 3 passes along the sequence of the field B of the <1-100> direction, and it passes along the position in which the end face of another side separated from the sequence of this field B. In this case, the sequence of the field B is not included substantially in the element region 2. Since things other than the above are the same as that of 10th and 1st embodiments, explanation is omitted. According to this 11th embodiment, the same advantage as a 1st embodiment can be acquired.

[0277]Next, a 12th embodiment of this invention is described. As shown in drawing 26, in this 12th embodiment, use the same GaN board 1 as a 10th embodiment, but. It differs from a 10th embodiment in that the element region 2 is demarcated so that the end face of a couple parallel to the laser stripe 3 may be located between the sequences of the field B of the <1-100> direction as for all and the laser stripe 3 may be located near the center of the field between the sequences of this field B. In this case, the sequence of the field B is not included substantially in the element region 2. Since things other than the above are the same as that of 10th and 1st embodiments, explanation is omitted. According to this 12th embodiment, the same advantage as a 1st embodiment can be acquired.

[0278]Next, a 13th embodiment of this invention is described. As shown in drawing 27, in this 13th embodiment, use the same GaN board 1 as a 10th embodiment, but. The one end face parallel to the laser stripe 3 passes along the sequence of the field B of the <1-100> direction, It differs from a 10th embodiment in that it passes along the position in which it was located between the sequence and the sequence of the next field B of the field B where the end face of another side adjoins the sequence of this field B immediately, and the laser stripe 3 separated not less than 50 micrometers from the

sequence of the field B. In this case, the sequence of the field B is included one in the element region 2. Since things other than the above are the same as that of 10th and 1st embodiments, explanation is omitted. According to this 13th embodiment, the same advantage as a 1st embodiment can be acquired.

[0279]Next, a 14th embodiment of this invention is described. As shown in drawing 28, in this 14th embodiment, use the same GaN board 1 as a 10th embodiment, but. The one end face parallel to the laser stripe 3 passes along the position which is separated from the sequence of the field B of the <1-100> direction, It differs from a 10th embodiment in that it passes along the position in which it was located between the sequence and the sequence of the next field B of the field B where the end face of another side adjoins the sequence of this field B immediately, and the laser stripe 3 separated not less than 50 micrometers from the sequence of the field B. In this case, the sequence of the field B is included one in the element region 2. Since things other than the above are the same as that of 10th and 1st embodiments, explanation is omitted. According to this 14th embodiment, the same advantage as a 1st embodiment can be acquired.

[0280]Next, a 15th embodiment of this invention is described. Drawing 29 is a top view showing the GaN board 1 used in this 15th embodiment. The field B of this GaN board 1 is the same as that of the GaN board 1 used in a 10th embodiment except for having arranged periodically at intervals of 200 micrometers in the <11-20> direction of GaN. In this case, the sequence of the field B is included two in the element region 2.

[0281]As shown in drawing 29, in this 15th embodiment, it is located near the center of the field between the sequences of the field B where the laser stripe 3 adjoins, and the end face of a couple parallel to the laser stripe 3 is located near [those] the center which are a field between the sequences of the outside field B immediately as the sequence of these fields B. Since things other than the above are the same as that of 10th and 1st embodiments, explanation is omitted. According to this 15th embodiment, the same advantage as a 1st embodiment can be acquired.

[0282]Next, a 16th embodiment of this invention is described. Drawing 30 is a top view showing the GaN board used in this 16th embodiment. This GaN board 1 is C plane direction in a n type. However, the GaN board 1 may be a thing of R side, A side, or M plane direction. In this GaN board 1, it consisted of a crystal with high average dislocation density into the field A which consists of a crystal with low average dislocation density, and has arranged periodically for example, at intervals of 400 micrometers in the <11-20> direction which intersects perpendicularly with the direction of <the field B<1-100 which extends in the direction of 1-100> at a line> of GaN. However, the <1-100> direction and the <11-20> direction may be replaced.

[0283]In this 16th embodiment, as shown in drawing 31, the end face of a couple parallel to the laser stripe 3 passes along the field B, and the element region 2 is demarcated so that the laser stripe 3 may be located near the center of the field between this field B. In this case, the sequence of the field B is not included substantially in the element region 2. Since things other than the above are the same as that of a 1st embodiment, explanation is omitted. According to this 16th embodiment, the same advantage as a 1st embodiment can be acquired.

[0284]Next, a 17th embodiment of this invention is described. As shown in drawing 32, in this 17th embodiment, the same GaN board 1 as a 16th embodiment is used, but it is a point which the one end face parallel to the laser stripe 3 passes along the field B, and passes along the position in which the end face of another side separated from the sequence of this field B, and differs from a 16th embodiment. In this case, the sequence of the field B is not included substantially in the element region 2. Since things other than the above are the same as that of 16th and 1st embodiments, explanation is omitted. According to this 17th embodiment, the same advantage as a 1st embodiment can be acquired.

[0285]Next, an 18th embodiment of this invention is described. As shown in drawing 33, in this 18th embodiment, use the same GaN board 1 as a 16th embodiment, but. It differs from a 16th embodiment in that the element region 2 is demarcated so that each end face of a couple parallel to the laser stripe 3 may be located between the fields B and the laser stripe 3 may be located near the center of the field between this field B. In this case, the sequence of the field B is not included substantially in the element region 2. Since things other than the above are the same as that of 16th and 1st embodiments, explanation is omitted. According to this 18th embodiment, the same advantage as a 1st embodiment can be acquired.

[0286]Next, a 19th embodiment of this invention is described. As shown in drawing 34, in this 19th embodiment, use the same GaN board 1 as a 16th embodiment, but. It differs from a 16th embodiment in that it passes along the position in which the one end face parallel to the laser stripe 3 passed along the field B, and it was located between the field B where the end face of another side adjoins the sequence of this field B immediately, and its next field B, and the laser stripe 3 separated not less than 50 micrometers from the field B. In this case, the one field B is included in the element region 2. Since things other than the above are the same as that of 16th and 1st embodiments, explanation is omitted. According to this 19th embodiment, the same advantage as a 1st embodiment can be acquired.

[0287]Next, a 20th embodiment of this invention is described. As shown in drawing 35,

in this 20th embodiment, use the same GaN board 1 as a 16th embodiment, but. It differs from a 16th embodiment in that it passes along the position in which the one end face parallel to the laser stripe 3 passed along the position which is distant from the field B, and the end face of another side was located between the field B which adjoins this field B immediately, and its next field B, and the laser stripe 3 separated not less than 50 micrometers from the field B. In this case, the sequence of the field B is included one in the element region 2. Since things other than the above are the same as that of 16th and 1st embodiments, explanation is omitted. According to this 20th embodiment, the same advantage as a 1st embodiment can be acquired.

[0288]Next, a 21st embodiment of this invention is described. Drawing 36 is a top view showing the GaN board 1 used in this 21st embodiment. The field B of this GaN board 1 is the same as that of the GaN board 1 used in a 16th embodiment except for having arranged periodically at intervals of 200 micrometers in the <11-20> direction of GaN. In this case, the sequence of the field B is included two in the element region 2.

[0289]As shown in drawing 36, in this 21st embodiment, it is located near the center of the field between the fields B where the laser stripe 3 adjoins, and the end face of a couple parallel to the laser stripe 3 is located near [those] the center which are a field between the outside fields B immediately as these fields B. Since things other than the above are the same as that of 16th and 1st embodiments, explanation is omitted. According to this 21st embodiment, the same advantage as a 1st embodiment can be acquired.

[0290]As mentioned above, although the embodiment of this invention was described concretely, this invention is not limited to an above-mentioned embodiment, and various kinds of modification based on the technical idea of this invention is possible for it.

[0291]For example, a numerical value, structure, a substrate, a raw material, a process, etc. quoted in the above-mentioned embodiment are only an example to the last, and may use a numerical value, structure, a substrate, a raw material, a process, etc. of differing from these, if needed.

[0292]Although the n type layer which forms laser structure was first laminated on the substrate in the above-mentioned embodiment concrete for example, and the p type layer is laminated on it, it is good also as a structure which made this and built-up sequence reverse, laminated the p type layer first on the substrate, and laminated the n type layer on it.

[0293]Although the case where this invention was applied to manufacture of the GaN system semiconductor laser of SCH structure was explained in the above-mentioned

embodiment, That this invention may be applied to manufacture of the GaN system semiconductor laser of DH (Double Heterostructure) structure, for example, of course, It may apply to manufacture of a GaN system light emitting diode, and may apply to the electronic run element using nitride system groups III-V semiconducter, such as GaN system FET and a GaN system heterojunction bipolar transistor (HBT), further.

[0294]In an above-mentioned embodiment, although H_2 gas is used as carrier gas at the time of growing up by the MOCVD method, mixed gas with other carrier gas, for example, H_2, N_2 or helium, Ar gas, etc. may be used if needed. In an above-mentioned embodiment, although the resonator edge face is formed by cleavage, a resonator edge face may be formed by dry etching like RIE.

[0295]

[Effect of the Invention]As explained above, according to this invention, so that the 2nd field where crystallinity is bad may not be included substantially highly [average defect density] more highly [average dislocation density] than the 1st field, Or since he is trying to demarcate an element region on a nitride system group-III-V-semiconducter board, a semiconductor substrate, or a substrate so that the 2nd field may not be included in the active region of an element, Defects, such as a rearrangement, can be prevented from almost existing in the chip obtained by scribing of a substrate. For this reason, various kinds of long lasting elements a reliable long lasting semiconductor light emitting element or characteristic is good, good [the characteristics such as a luminescent characteristic, are good, and] a reliable long lasting semiconductor device or characteristic and reliable are realizable.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is the perspective view and sectional view for explaining the main point of the embodiment of this invention.

[Drawing 2]It is a top view for explaining the main point of the embodiment of this invention.

[Drawing 3]It is a top view for explaining the main point of the embodiment of this invention.

[Drawing 4]It is a top view for explaining the main point of the embodiment of this invention.

[Drawing 5]It is a top view for explaining the main point of the embodiment of this invention.

[Drawing 6]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 1st embodiment of this invention.

[Drawing 7]It is an approximate line figure showing an example of distribution of dislocation density [/ near the high defect region of the GaN board used in a 1st embodiment of this invention].

[Drawing 8]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 1st embodiment of this invention.

[Drawing 9]It is a sectional view for explaining the manufacturing method of the GaN system semiconductor laser by a 1st embodiment of this invention.

[Drawing 10]It is a sectional view for explaining the manufacturing method of the GaN system semiconductor laser by a 1st embodiment of this invention.

[Drawing 11]It is a sectional view for explaining the manufacturing method of the GaN system semiconductor laser by a 1st embodiment of this invention.

[Drawing 12]It is a sectional view for explaining the manufacturing method of the GaN system semiconductor laser by a 2nd embodiment of this invention.

[Drawing 13]It is an approximate line figure showing the end face of the chip obtained by scribing in the manufacturing method of the GaN system semiconductor laser by a 2nd embodiment of this invention.

[Drawing 14]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 3rd embodiment of this invention.

[Drawing 15]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 4th embodiment of this invention.

[Drawing 16]It is a top view for explaining the manufacturing method of the GaN

system semiconductor laser by a 5th embodiment of this invention.

[Drawing 17]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 6th embodiment of this invention.

[Drawing 18]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 7th embodiment of this invention.

[Drawing 19]It is a sectional view showing the GaN system semiconductor laser manufactured by 7th embodiment of this invention.

[Drawing 20]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by an 8th embodiment of this invention.

[Drawing 21]It is a sectional view showing the GaN system semiconductor laser manufactured by 8th embodiment of this invention.

[Drawing 22]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 9th embodiment of this invention.

[Drawing 23]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 10th embodiment of this invention.

[Drawing 24]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 10th embodiment of this invention.

[Drawing 25]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by an 11th embodiment of this invention.

[Drawing 26]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 12th embodiment of this invention.

[Drawing 27]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 13th embodiment of this invention.

[Drawing 28]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 14th embodiment of this invention.

[Drawing 29]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 15th embodiment of this invention.

[Drawing 30]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 16th embodiment of this invention.

[Drawing 31]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 16th embodiment of this invention.

[Drawing 32]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 17th embodiment of this invention.

[Drawing 33]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by an 18th embodiment of this invention.

[Drawing 34]It is a top view for explaining the manufacturing method of the GaN

system semiconductor laser by a 19th embodiment of this invention.

[Drawing 35]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 20th embodiment of this invention.

[Drawing 36]It is a top view for explaining the manufacturing method of the GaN system semiconductor laser by a 21st embodiment of this invention.

[Description of Notations]

1 ... A GaN board, 2 ... An element region, 3 ... Laser stripe, 5 ... A n type GaN buffer layer, 6 ... N type AlGaN clad layer, 7 ... A n type GaN lightguide, 8 ... An active layer, 9 ... Undoped InGaN deterioration prevention layer, 10 [... A p type GaN contact layer, 14 / ... A ridge, 15 / ... An insulator layer, 16 / ... n lateral electrode, 17 / ... p lateral electrode] ... A p type AlGaN cap layer, 11 ... A p type GaN lightguide, 12 ... A p type AlGaN clad layer, 13